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Electric Railway Journal

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to Volume 75

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Getting the Most from the INDEX

THIS is essentially a subject index, rather than an index of titles. An article treating a number of different subjects is listed under each of them. In addition, a geographical reference is published wherever the article relates to a particular railway, city, state or country. Entries about an electric railway in the United States or Canada are listed under the name of the city in which the main office of the company is located. Foreign railways are listed under the country.

In the subject index, an alphabetical arrangement is followed. The list of keywords, giving all the subjects considered as major topics for classification, appears below.

In addition to the groups of articles covered by these headings, papers and reports from electric railway and other associations are grouped under the names of the various organizations. Signed articles also are indexed by the name of the author. When the name of the author is known to the reader, this supplies the simplest method of locating the article.

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Bus Maintenance
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Bus Shops and Garages
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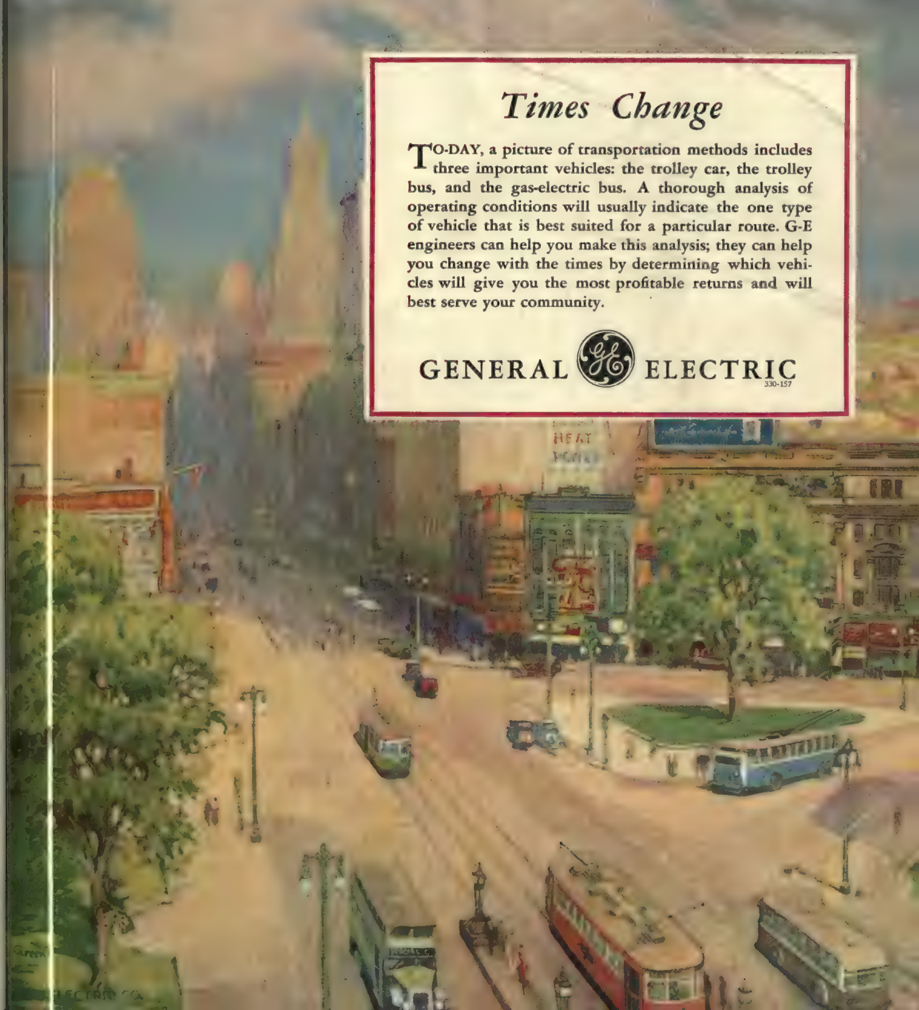

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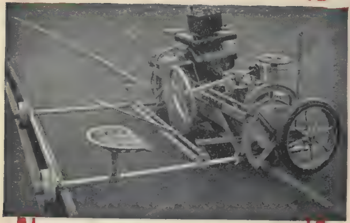
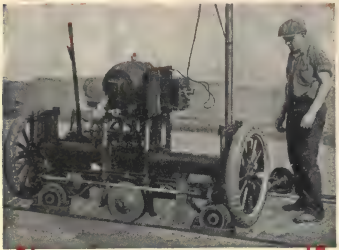


Improved Atlas Rail Grinder

Eureka Radial Rail Grinder



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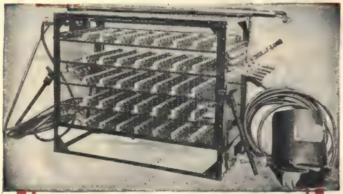

Ajax Electric Arc Welder

Janus needs a new face

The old two-faced god has been peering forward and backward for ages. The past is gone. The future is veiled. Only the present is here. Janus needs a new face to see things as they are. He'd learn plenty.

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— that they ride the rails when the rails are good

— that rails are good only where constant grinding, arc welding and more grinding keep them good

— that successful roads use successful tools

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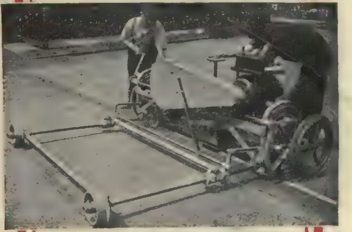

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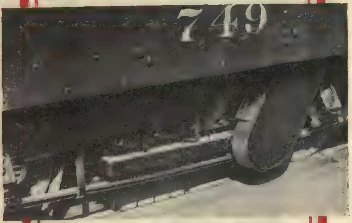
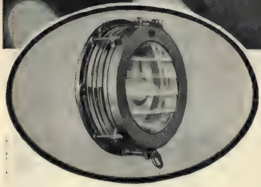


Reciprocating Grinder Car, showing one of the grinding units.

RTW Curve Oiler

DISTINCTLY A BUS MIDST HEADLIGHT CONFUSIO



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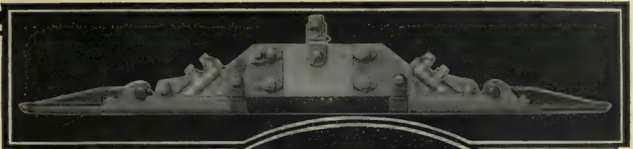
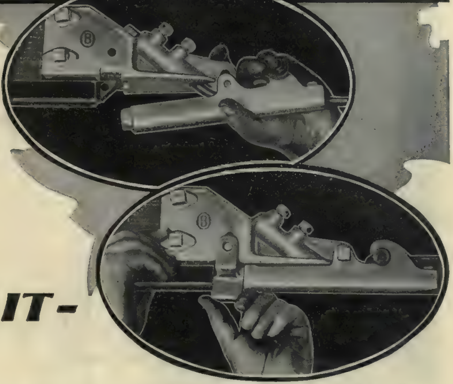
BECAUSE a well illuminated dash is such excellent insurance against accidents involving street cars and automobiles, the O-B Type WCF Dash Illuminating Headlight has come to be recognized as an essential requisite for street cars. It illuminates the dash so effectively that motorists do not mistake an approaching street car for a stationary light. Ample warning to the motorist approaching from a side street is provided by the diffusion of light through the side lens.

As expedient as is dash illumination for street cars, it is much more expedient for trolley buses. They swing out beyond their customary traffic lane when passing slower vehicles. In such instances it is desirable that approaching motorists identify the bus as such, in order to make proper allowance to avoid side-swiping the longer vehicle.

Efficiency-minded men will recognize the great significance of the fact that of the 192 trolley buses put into service between July 1922 and July 1930, all but 13 were equipped with O-B Headlights. And of this total, approximately one-half of these buses utilized the WCF Type, providing dash illumination.





HALF-SOLED WHILE YOU WAIT-

RESTORING original efficiency to an O-B Renewable-Underrun Section Insulator by renewing worn units of the underrun is just like restoring a pair of good shoes by renewing worn soles. The tops are good; the "set" is there; and the cost is much less than the cost of total replacement.

"Half-soling" an O-B Renewable-Underrun, Section Insulator is a simple operation. Take out two bolts, and off comes the fibre center runner and arcing tips. Take out two more bolts, and off comes the end runners. Use new units; reverse the operation, and the assembly is completely restored. "Half-soled while you wait"—that is, while you would otherwise be waiting for a lineman to detach other types of insulators from the span and trolley wires.

Thus, three important economies are effected by the use of O-B Renewable-Underrun, Section Insulators: materials cost is reduced; labor is reduced and service interruptions are decreased. Full information is available in New Products Supplement No. 4 to O-B Catalog No 20. Or, ask your O-B salesman.

The overhead of the O-B Renewable-Underrun, Section Insulator remains aligned and attached to span wires while any or all units of the underrun are being renewed.

New Products Supplement No. 4

This latest Supplement to O-B Catalog No. 20 shows the progress that has been made by O-B in electric railway material development during the past three years. If you want to keep informed and do not have a copy, write for one.

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Making Cars Move in the Tempo of the Times

Present-day transportation vehicles must move with speed and safety. Adequate and effective brake control is vital. In every class of electric railway service air brakes have met the widely-varying needs . . . The flitting street car, the speeding interurban, the clattering elevated, the rushing subway, the nimble trolley bus—are all able to move in the tempo of the times because of effective brakes, modernized and adapted to a specific purpose—air brakes, complete from compressor to brake cylinder, made by the WESTINGHOUSE TRACTION BRAKE CO., General Office and Works, Wilmerding, Pa. » » » » » »

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ONE INDELIBLE IMPRESSION EVERY PASSENGER HAS WHEN ENTERING THIS CAR: "HERE I CAN REST . . . OR READ . . . OR THINK . . . OR DOZE . . . I AM THERE BEFORE I REALIZE IT" . . . WHO CAN HELP PREFERRING SUCH COMFORT?

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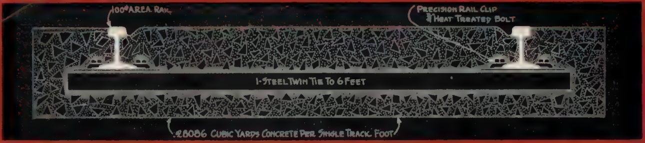
A BETTER SEAT FOR EVERY TYPE OF MODERN TRANSPORTATION . . .

HERE'S the "Something" that MUS

The Best Track ever bui

A UNIT DESIGN UNIFIED

in the field by the MORTAR-FLOW Method of Construction


100# AREA RAIL
PRECISION RAIL CLIP & HEAT TREATED BOLT
I-STEEL TWIN TIE TO 6 FEET
.28086 CUBIC YARDS CONCRETE PER SINGLE TRACK FOOT

Steel Twin Tie Track is not only a unit structure in its design, which provides large effective bearing plates with tie members reinforcing a foundation slab integral with the paving, but by application of the Mortar Flow Principle of vibrating the structure during placement of the concrete, it is actually made a perfectly unified structure in the street.

The machine can be operated by any kind of labor and the cost is a low rental charge per track foot.

TYPICAL BIG CITY USERS AND COSTS

The costs noted below are not directly comparable without complete unit and labor costs as well as details of design. In some cases as noted, only labor and material costs are given.

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[illegible] Electric Co.
Only labor and material costs included in Washington figure

DETROIT $ 9.55

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CAPITAL TRACTION CO.

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Cleveland uses the Mortar Flow Method only

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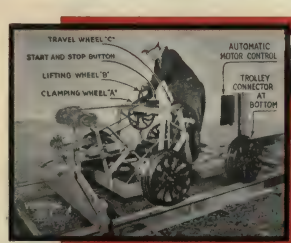
be done about the 1931 Budget !

at $\$2^{\underline{00}}$ to $\$5^{\underline{00}}$ lower first cost

A COMPLETE MECHANICAL METHOD —

for Economy and Uniformity

In the complete mechanical method, the track layer and bolt tightener insure a uniform track assembly for the lowest labor costs. The Mortar Flow Pulsator which follows the placing of the concrete, clamps to the rails and vibrates the whole track structure into the concrete base. The 8800 high frequency vibrations per minute fill all voids, tremendously increase strength of bond between steel and concrete. The structure is sealed against water by a dense, more waterproof concrete and labor of leveling is reduced, tamping eliminated.



"Mortar Flow" Vibrating Machine

Track Laying Machine

Bolt Tightening Machine

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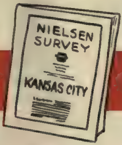
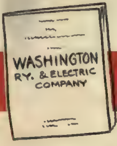


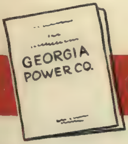
Nielsen Survey
No. 15-52-KM



Rasmussen
Survey

Rasmussen
Survey

Rasmussen Survey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THE INTERNATIONAL STEEL TIE COMPANY

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an integral part of every Modern Trolley Bus

To derive the greatest possible benefit from the rapid acceleration and fast running speed of the modern trolley bus, it is essential to reduce to a minimum the standing time required for passenger interchange. *That's why every trolley bus built since 1927 is equipped with National Pneumatic Door Control.*

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SPECIFY
KEYSTONE EQUIPMENT
FOR
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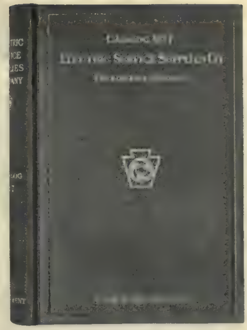
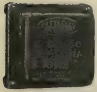
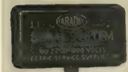


Catalog No. 7—the Car Equipment Catalog of the Railway Industry—687 pages.

Ask for Supplemental Sheets on Lighting Fixtures.



Faraday Buzzers



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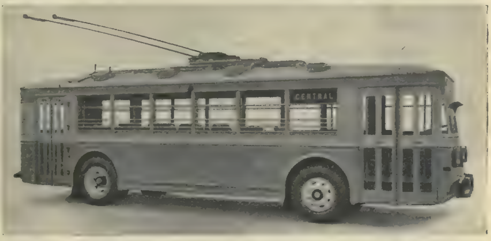
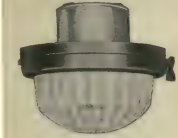
Faraday Push Buttons

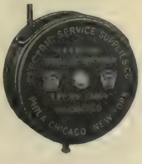
Keystone-Hunter Illuminated Destination Signs



Keystone Equipped Trolley Bus, built at American Plant of J. G. Brill Co.



Type T Safety Dome Lighting Fixture



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The line of Keystone Car Equipment, proven good by years of service and manufactured by specialists in the design of transportation equipment, is equally well adapted to use on trolley buses.

Keystone Rotary Foot Gong

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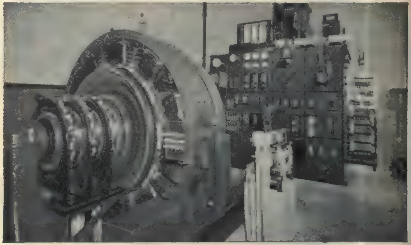
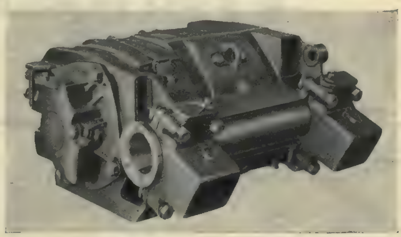

Interior of G-E equipped automatic substation of Northwestern Pacific, Pine, Calif.

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

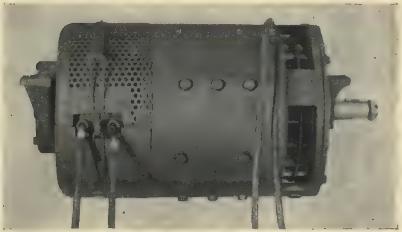
and the Needs of Transportation Change with the Times

The new GE-702 (35-hp.) motor for trolley cars

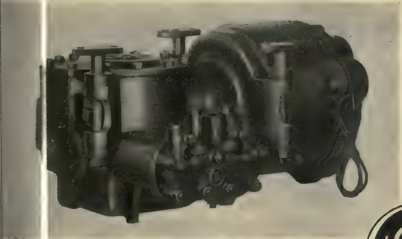


The new GE-706 (100-hp.) motor for trolley cars

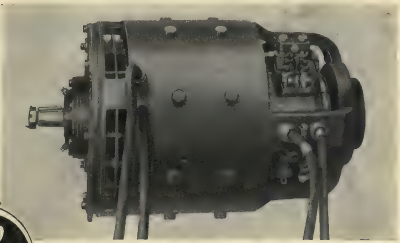
The new PCM automatic multipoint control for trolley buses



The new GE-1154 (50-hp.) motor for trolley buses



The new CP compressor for trolley buses



The new GE-1151 (50-hp.) motor for gas-electric buses

GENERAL ELECTRIC'S contributions to local transportation in 1930 followed more than forty years of service to electric-railway operators. The development of motors, control, and other equipment for the trolley bus is only another instance of General Electric's readiness to meet the ever changing and exacting requirements in this field.

330-158

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Times Change

PROGRESSIVE IDEAS to keep pace with the changing times—these are among the contributions of General Electric to the field of transportation. Such accomplishments have been made possible by years of hard work and experience and a huge investment in factory equipment. An expert engineering staff is ready at all times to anticipate and meet changing conditions with new developments and improved apparatus. G-E engineers are thoroughly familiar with present-day transportation needs. Let them help you to analyze the conditions on your routes and to select the vehicles which will give you the most profitable returns and your community the best service.

330-159

GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

New York
January, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 1

Progress Despite Difficulties

ECONOMIC disturbances of unprecedented intensity have shaken the entire business and industrial structure of this country in the past year. The electric railways have felt the effects principally through a reduction in the number of passengers carried and a consequent decrease in gross revenue. Undoubtedly, these losses have been serious, but the essential stability of the industry has enabled it to weather the storm much better than most other industries. In fact, notable progress has been made in many directions despite the difficulties encountered during the year just ended.

The index of the industry's activities for 1930 stands, in general, at about 94 per cent of the 1929 figure. Gross earnings were only about 6 per cent below those of the preceding year. While the per cent reduction in number of passengers carried was slightly larger than that, the effect was offset somewhat by a small increase in the average fare. Operating expenses were reduced to some extent. This was accomplished principally through curtailment of service, there being no appreciable change in average wages. The economies effected, however, were not sufficient to maintain net revenue at the level of the preceding year. For the industry as a whole the decrease in the net revenue was about 10 per cent.

Improvement Programs Curtailed Slightly

AT THE BEGINNING OF THE YEAR, the annual survey made by the JOURNAL showed that the industry was planning to spend about $371,000,000 for extensions, betterments and maintenance. These figures represented a substantial increase over the 1929 budgets. As time progressed, however, it became necessary to curtail the original plans slightly. Reports received during the last two weeks indicate that the industry's capital and maintenance expenditures in 1930 totaled approximately $340,000,000, somewhat over 94 per cent of the similar expenditures during the preceding year. In most instances where reductions were made, they were in capital accounts, maintenance expenditures usually having been continued at the full rate.

Rolling Stock Purchases Moderate

DESPITE THE UNSATISFACTORY CONDITIONS which made it necessary for the railways to reduce their budgets, the purchase of new rolling stock continued at a fair rate during 1930. A total of more than 600 new city and interurban cars were ordered as well as more than 100 multiple-unit cars for electrified suburban service. Of greater significance than the actual number of cars, however, was the organization of the Presidents' Conference and the appointment of a research engineer to study the subject of car design. This body will have at its disposal ample funds for far-reaching experimentation. While it is not expected that any radical changes in design will occur in the immediate future, the movement is indicative of the realization by the industry that improvement in vehicle design is urgently needed.

Bus Expansion Continued

NEW BUSES BOUGHT by the electric railways totaled approximately 1,600 in the past year. This is a slightly smaller number than the purchases of the year before, but represents a substantial addition to the railways' complement of automotive equipment. That most of the new buses were bought for the purpose of extending service is indicated by the considerable increase in the total mileage of bus routes. The number purchased for replacement of worn out and obsolete vehicles was virtually the same as in 1929. Without doubt, however, this factor will become of increasing importance in future years.

Volume of Trackwork Larger

THE VOLUME OF TRACKWORK DONE by the electric railways last year was a little greater than that of the year before. Reconstruction of track was carried out on a somewhat larger scale while the mileage of extensions showed a slight decrease, due to the necessity to curtail capital expenditures. It is particularly significant that in the larger cities extensions to street railway tracks continue to be made every year. Several hundred miles of track were abandoned during 1930, principally interurban lines through sparsely settled territory where it was considered more economical to render the required transportation service by bus. A few electric railway systems in small towns were abandoned. In all but one of more than 50,000 population, however, the electric railway remains the backbone of the local transportation system.

Trolley Bus Service Extended

IN THE FIELD OF TROLLEY BUS OPERATION, notable expansion occurred during the year just ended. Important new installations were made in several cities, bringing the total number of vehicles in operation or on order to nearly 200 on some 70 miles of route. Of even greater importance is the success that has been attained with this type of service, and its popularity with the public. Consideration is now being given to extending the service in several cities were it is at present in operation, and the possibilities of new installations are being studied in several other localities.

More Railways Operating Taxicabs

CO-ORDINATION OF ALL STREET TRANSPORTATION FACILITIES was advanced through the extension of electric railway operation of taxicabs. Several more railways were added to the list of taxicab operators during the past year, and the number of vehicles operated under railway auspices was nearly doubled. This expansion is attributable in large measure to the progress of regulation. Wider recognition is being accorded to the principle that the taxicab is essentially a common carrier, and should be regulated as such. Where this has been done, the quality of service has been improved, and the business has been placed upon a firmer economic basis.

Rapid Transit Gains

NOTEWORTHY PROGRESS WAS MADE in the field of rapid transit during 1930. The mileage of new rapid transit route actually placed in operation was comparatively small, but construction work continued steadily on a number of important projects. Plans were made during the year for rapid transit in several cities which do not at present enjoy this type of service. With the constantly increasing concentration of population in large urban centers, the provision of rapid transit is becoming of greater importance every year.

In the field of heavy electrification, the past year showed marked activity. Suburban service with electric trains was inaugurated on more than 300 miles of new route. Additional electric equipment was purchased by several roads. Plans were announced for extensions of electrification on a large scale.

Prospects for 1931 Encouraging

EXPENDITURES PLANNED for new plant and equipment and maintenance next year compare favorably with similar figures for the year just ended. According to present budget estimates, the capital expenditures in 1931 for the industry as a whole will be appreciably greater than in 1930. In fact, several companies report very substantial increases. Estimates of maintenance expenditures show no marked change. In this connection, it should be remembered, too, that construction costs in general, and especially material costs, have shown a sharp decrease during the past few months. Hence, for the same expenditure of money a larger program can be carried out.

While it is unlikely that prosperity will be restored to general business or to the electric railways in the twinkling of an eye, gradual improvement in the situation may reasonably be expected during 1931. Past experience indicates that electric railway traffic responds quickly to improvement in the general business situation. Considering all phases of the situation in the field of community transportation, the outlook for the coming year appears to be distinctly encouraging.

Electric Railways
Make Good Showing
in a Year of Uncertainty

Despite unfavorable business trends the companies carried nearly as many passengers as in their peak years. Sharp curtailment of operating expenses aided in retaining a reasonable net revenue

RESULTS of electric railway operation in the year just closed have been far from discouraging. While the traffic and revenues have been less than in 1929, they have held up well, considering the general business and industrial situation. The work of readjustment to fit existing conditions, begun by the railways nearly two years ago, was continued with unabated vigor. While the economic difficulties of the country as a whole prevented any gain in gross revenue save in a few isolated nstances, the reduction in operating expenses which has been brought about on nearly all properties permitted the industry to come through the year with a much better showing than that made in many other lines of endeavor.

Earnings of the electric railways and their subsidiary bus lines for 1930 were approximately $1,058,000,000, according to preliminary estimates made by the statistical department of the American Electric Railway Association. This represents a reduction of only 6 per cent from the gross receipts for 1929, which was the banner year of all time for revenue in the electric railway business.

Operating expenses were reduced sharply during the past year, going down to $750,000,000 as compared with $781,400,000 the year previous, and bringing the cost of operation down to the lowest since 1922. This was accomplished partly by reduction in the quantity of service, and partly by elimination of various wastes and by the adoption of new and improved equipment and methods in many departments. Wages absorbed the greatest part of the revenue, 38.3 per cent, while other operating expenses amounted to 32.7 per cent of the gross. Taxes and fixed charges came to 24.4 per cent. Deducting all these expenses, there was 4.6 per cent of the gross remaining as the net income for the year.

Even the sharp reduction in expenses could not offset the smaller gross and prevent a shrinkage in net revenue. This latter went down from $343,570,000 to $308,000,000. Rents, interest, taxes and other fixed charges remained almost as large as they were the year before, so that the net income available for dividends and surplus dropped to $50,500,000, the lowest since 1924. In view of the general business situation and in comparison with the behavior of other industries during the year, this showing is decidedly favorable, even though the figure is far below the net of $81,620,000 earned in 1929.

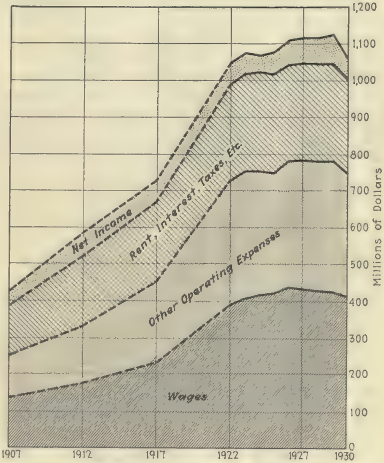


Fig. 1—Distribution of revenues of U. S. electric railways

Values for 1922 and earlier years from the U. S. census; for subsequent years from data collected and compiled by the American Electric Railway Association.

Traffic held up remarkably well all through the year, the passengers carried being 14,600,000,000, which was only about 1,000,000,000, or 7½ per cent, less than for the year previous. Of these passengers, 13,275,000,000 rode on cars and the remaining 1,325,000,000 on buses operated in conjunction with electric railway properties. The number of passengers carried for the past fourteen years is shown in Fig. 2.

Route mileage has continued to grow, although at a rate somewhat reduced from that which has taken place in the past few years. Fig. 3 indicates the growth in the mileage operated. The great expansion of 1924 and 1925 carried the electric railways and their subsidiary bus lines into such a greatly augmented territory that the immediate demands were very well taken care of. In succeeding years the increase of route mileage was at a somewhat slower pace. Against the expansion must

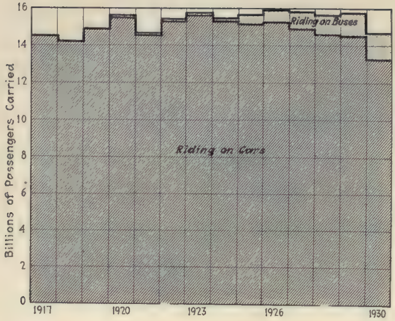


Fig. 2—Passengers carried annually by U. S. electric railways and their bus subsidiaries
Values for 1917 and 1922 from U. S. census; for other years from A.E.R.A.

be set the small amount of abandonment of unprofitable lines, or in a few instances of entire systems, that experience had proved were unnecessary and were not self-sustaining. It is now quite generally recognized that the service as a whole must suffer when a company is forced to furnish large amounts of service where there is insufficient business to justify it.

Car and bus purchases have continued during the year, although the number of vehicles bought has been somewhat curtailed. The number of passenger and freight cars, electric locomotives and buses operated by electric railway properties are plotted in Fig. 4.

With the reduction in riding during the year, a certain curtailment of service was unavoidable. The total car-miles and bus-miles operated declined to 2,531,200,000 from 2,593,300,000 in 1929. As will be seen in Fig. 5, this is the first time in recent years that there has been an actual curtailment of service from a previous year. The net change was made by a decrease of 65,000,000 car-miles, which was partially offset by an increase of 2,900,000 bus-miles. The vehicle mileage operated last year, however, was exceeded only in 1929, and by only 2.4 per cent, a remarkable showing in view of the large reduction in expenses. Very evidently the quality of service was not reduced, since the drop in car mileage was only about one-third as great as the reduction in revenue passengers.

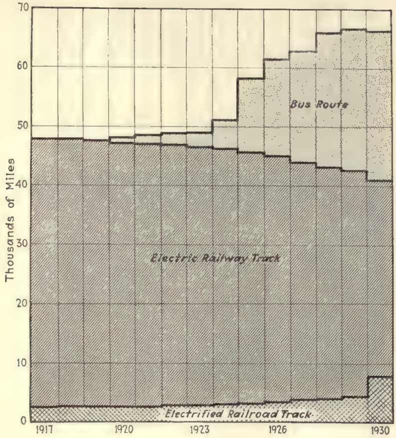


Fig. 3—Electric railway track and bus route mileage in the United States
Figures compiled by Electric Railway Journal.

Another valuable comparison is available that shows the trend of the industry. This is the index of riding as compared with automobile registration, shown in Fig. 7, which presents automobile ownership and riding on a per capita basis. The enormous growth of automobile registration, while it has gone from nothing to almost one car for every five persons in the United States in the past few years, has caused only a slight effect in reducing the riding on the public transportation vehicles included in the industry. In other words, it has done nothing more than to halt the growth in the riding habit and to stabilize it at about 100 rides per year for each person in the United States. Since a little more than half the population is concentrated in cities, according to the last two censuses, this is equivalent to about 200 rides per annum for each urban resident.

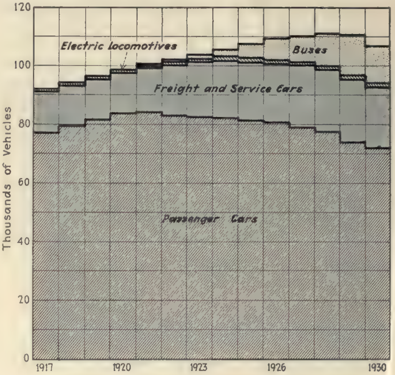


Fig. 4—Cars and buses of the U. S. electric railway systems
Figures compiled by Electric Railway Journal.

In this connection it is significant to note that in 1930 automobile registration, for the first time on record, shows a recession, dropping from 190 per capita to 189. This reduction, while small, is in sharp contrast with an increase the previous year from 178 to 190. It may be an indication that automobile ownership has about reached the saturation point. It also may mean that there will be more riding on public vehicles.

That there is a distinct relation between industrial employment and riding is indicated by Fig. 6. The curve of passenger traffic has been replotted this year to show seasonal fluctuations, rather than giving a moving average of the twelve-month period. The variation in riding between winter and summer, which in previous years has changed only slightly, became more pronounced in 1930, the index of passenger traffic falling off almost in proportion to the industrial employment. The two indexes are taken to the base 100 for the year 1928, so that the averages of riding and employment for that year are identical. For 1929, which represents the peak of employment, the index of riding was almost exactly the same as for 1928. For the twelve months beginning with November, 1929, the riding was at 94.5. Corresponding to this the employment index was 92.3. Evidently the fluctuations of riding were materially less than those of employment.

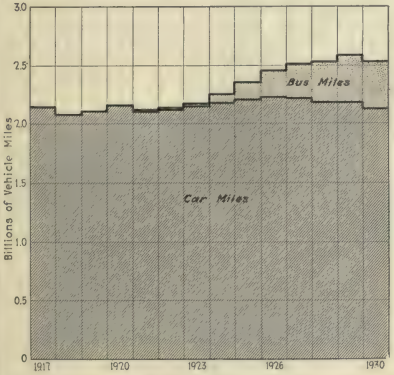


Fig. 5—Revenue vehicle-miles operated annually by U. S. electric railway systems

Car-miles for 1917-1922 from U. S. census; values of bus-miles and car-miles for other years from A.E.R.A.

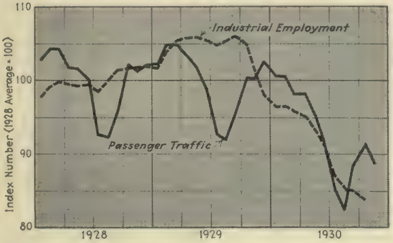


Fig. 6—Trends of passenger traffic and industrial employment in the United States (1928 = 100)

Passenger traffic from A.E.R.A.; data on employment from U. S. Bureau of Labor Statistics.

Fig. 8 shows the change in cash fares for 289 electric railways. Few changes occurred last year. The number of 5-cent fares remained the same, while some of the 6-cent, 7-cent and 8-cent rates were abandoned in favor of a 10-cent base. The sum of such changes in the larger cities was ten, making the total number of 10-cent fares shown 136 at the close of the year. In nearly all instances there are in effect reduced-rate tickets, weekly passes, or other concessions to the regular rider that make the average rate considerably lower than these cash fares.

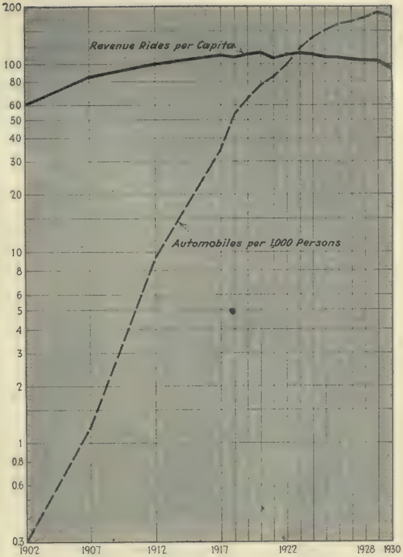


Fig. 7—Automobile registration and passenger traffic in the United States on a per capita basis

Electric railway traffic for 1917 and earlier years and for 1922 from U. S. census; for other years from A.E.R.A. Passenger automobile registrations from National Automobile Chamber of Commerce.

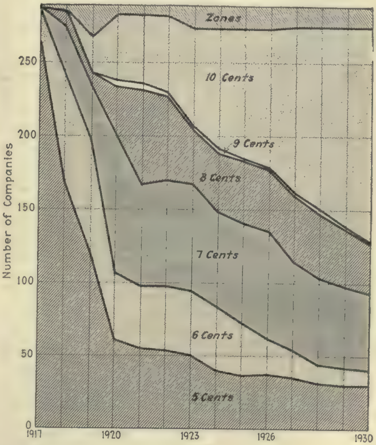


Fig. 8—Cash fare trends on U. S. electric railways

Based on 289 companies reporting to the A.E.R.A. which operate in 272 cities with a population of 25,000 or more, according to the 1920 census.

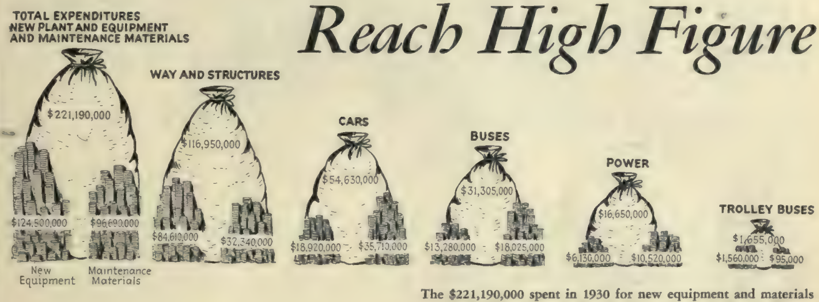
Statistics of City and Interurban Electric Railways and Electrified Steam Lines

As of Jan. 1, 1931

	Number of Operating Companies	Miles of Track	Passenger Cars		Electric Loco-motives	Freight Cars		Service Cars	Buses Operated	Miles of Bus Route
			Motor	Trailer		Motor	Trailer			
New England States										
Connecticut	8	1,137.11	1,297	111	146	48	8	306	255	623.57
Maine	11	414.21	312	8	7	22	69	62	5	25.00
Massachusetts	25	1,766.10	3,660	259	6	19	12	716	859	1,311.69
New Hampshire	11	128.20	176	0	4	0	1	30	36	90.78
Rhode Island	3	278.80	497	22	3	11	0	95	180	195.00
Vermont	4	20.10	7	0	3	2	1	3	24	32.20
Eastern States										
Delaware	1	69.74	101	0	0	0	0	13	24	71.02
District of Columbia	5	379.87	849	20	6	2	11	106	167	232.32
Maryland	5	667.64	1,406	163	15	28	114	135	229	1,976.53
New Jersey	14	1,245.30	2,034	241	0	5	0	259	2,556	3,025.49
New York	69	4,900.11	15,935	2,672	209	182	90	1,452	904	998.75
Pennsylvania	76	4,022.28	6,800	255	15	103	96	906	1,058	2,368.32
Virginia	13	674.55	634	61	16	10	7	78	249	168.05
West Virginia	10	623.13	343	0	23	25	15	48	80	550.73
Central States										
Illinois	47	3,239.98	6,253	947	77	77	2,517	762	476	1,335.99
Indiana	22	2,232.40	1,612	85	27	383	519	448	437	1,155.05
Iowa	23	927.77	624	34	39	13	1,003	191	216	1,231.56
Kentucky	7	463.51	690	71	0	17	6	95	302	87.79
Michigan	19	1,070.76	2,075	295	25	33	207	235	1,028	1,541.86
Minnesota	8	696.02	1,199	26	2	1	0	114	123	460.07
Missouri	13	1,140.08	2,328	186	5	14	22	334	189	266.94
Ohio	51	3,164.20	3,439	569	47	172	486	585	932	1,855.25
Wisconsin	15	737.72	1,204	53	7	23	20	41	326	2,037.11
Southern States										
Alabama	9	324.73	382	60	2	3	0	60	19	25.74
Arkansas	7	117.19	229	10	0	2	0	17	22	17.16
Florida	6	203.85	362	2	0	2	2	16	90	68.02
Georgia	8	401.55	560	21	2	7	0	55	82	75.51
Louisiana	8	249.64	760	45	0	2	0	75	99	75.35
Mississippi	7	42.07	46	0	0	0	0	3	56	93.25
North Carolina	8	311.78	185	10	17	4	159	40	67	48.00
South Carolina	4	59.92	74	2	0	3	0	9	8	30.30
Tennessee	9	434.32	605	53	3	2	1	71	51	130.13
Western States										
Arizona	3	24.46	33	0	0	0	0	3	17	26.98
California	29	3,374.35	3,981	193	104	66	2,780	466	575	601.00
Colorado	9	335.54	365	120	9	2	220	84	60	100.42
Idaho	1	0	0	0	0	0	0	0	11	17.00
Kansas	14	423.54	241	23	14	16	31	33	114	90.19
Montana	8	844.94	105	14	50	35	1,430	31	5	3.50
Nebraska	4	183.88	420	20	2	1	1	66	49	42.49
North Dakota	3	23.12	41	1	0	0	0	9	6	6.55
Oklahoma	10	362.72	271	3	19	12	50	34	157	184.79
Oregon	5	519.65	608	70	27	4	470	113	51	39.90
South Dakota	1	0	0	0	0	0	0	0	18	20.55
Texas	22	988.09	1,246	39	5	28	16	136	341	428.46
Utah	7	467.68	219	50	14	4	344	54	21	80.68
Washington	18	1,268.80	919	64	44	93	192	89	207	869.78
Wyoming	1	0	0	0	0	0	0	0	9	28.50
United States Total	661	40,961.40	65,127	6,878	994	1,476	10,900	8,478	12,790	24,745.32
United States Possessions	5	120.79	243	0	1	11	0	25	98	64.98
Canada	57	2,424.51	3,792	376	61	225	437	431	634	1,288.33
Grand Total	723	43,506.70	69,162	7,254	1,056	1,712	11,337	8,934	13,522	26,098.63

FIGURES presented in this table are compiled from reports recently received by ELECTRIC RAILWAY JOURNAL from companies representing more than 95 per cent of the total electrified track mileage of the United States and Canada, supplemented by other reports previously received. The number of companies shown is the number of actual operating companies and does not include subsidiaries whose physical property has been absorbed by merger, etc., nor holding companies which do not operate under their own names. Track mileage and equipment data of interstate companies are listed according to the actual location of track.

Expenditures for New Equipment and Maintenance *Reach High Figure*



The $221,190,000 spent in 1930 for new equipment and materials was apportioned as indicated. For each item the total is shown on the money bag, the amount for new equipment is represented by the left hand stack of coins and that for maintenance materials by the right hand stack

Total for 1930 less than 6 per cent under that for 1929. Increases shown for way and structure and trolley bus capital accounts, as well as maintenance materials for trolley buses, buses and power equipment. Budgets for 1931 indicate rise of almost 4 per cent over past year

ALTHOUGH the past year was one of uncertainty for business in general in this country, the electric railway industry held up very well under the strenuous conditions and ended the year with a good record. Probably the most significant fact is that total expenditures for new equipment and maintenance were reduced only 5.12 per cent under the 1929 figure. In face of declining revenue it was to be expected that economies would be effected wherever possible. These were made on a large scale on some properties, but the budgets indicate that economies were made judiciously and that so-called "costly economies" were avoided to a great extent. The maintenance of this high expenditure mark demonstrates again the great stability of the electric railway industry and its ability to hold up well during a trying period.

The decrease of 5.12 per cent represents a recession of $18,320,000, from $357,455,000 to $339,135,000. The total decline was made up of $10,970,000 for capital account, $3,845,000 for maintenance materials and $3,505,000 for maintenance labor. This bears out the logical assumption that the greatest curtailment would be in expenditures for new plant and equipment, rather than for maintenance.

It is worthy of note that the largest single capital account and one other item for new plant and equipment showed increases — namely, way and structures and trolley buses. In the other three accounts the losses were all in about equal moderate proportions. In the maintenance material accounts, losses were shown for way and structures and cars, but slight gains were registered for trolley buses, buses and power. In the maintenance labor accounts, all showed slight decreases with the exception of trolley buses and buses.

Determined to forge ahead and apparently convinced that the present depression is nearing its end, the electric railways have budgeted for 1931 an amount totaling $352,650,000, $13,515,000 more than for 1930, or 3.99 per cent. This increase is made up of larger amounts in every capital account, and a larger sum for maintenance labor. Budgets for maintenance materials show practically the same figures as for 1930. Although none of the gains are outstanding, the composite result is indeed encouraging. They indicate clearly that the operators expect a brighter year than the past one. Much benefit is bound to accrue from the psychology behind this optimistic attitude.

Surveying the total amounts

Annual Expenditures for Extensions, Betterments and Maintenance

1927	$351,933,000
1928	343,880,000
1929	357,455,000
1930	339,135,000
1931 Forecast	352,650,000

for extensions, betterments and maintenance for the years of 1927 to 1930, and the estimate for 1931, an interesting trend is revealed. The decline from $351,933,000 in 1927 to $343,880,000 in 1928 marked the temporary ending of a period showing smaller amounts expended annually. The turning point was reached at the beginning of 1929 and the end of that year showed a rise to the total of $357,455,000. Had the serious business depression, which started in October of 1929, been avoided, undoubtedly the past year would have shown a still further increase. Necessary curtailments for capital account and maintenance, of course, prevented this increase. It is significant, however, that the total for 1930 was only slightly under the amount for 1929. Budgets for 1931, which in every respect appear to be conservative, show the figure $352,650,000, which represents a total higher than those of 1927, 1928 and 1930, and only slightly under the high figure for 1929. When business does return to normal, it is reasonable to expect that this figure will rise steadily.

Purchases Planned by Electric Railways for 1931, Compared with Actual Figures for Past Years Compiled by "Electric Railway Journal"

New Plant and Equipment—Capital

	1925	1926	1927	1928	1929	1930	Forecast 1931
Way and structures...........	$52,400,000	$51,200,000	$77,365,000	$90,050,000	$81,890,000	$84,610,000	$88,700,000
Cars........................	50,400,000	40,000,000	34,758,000	18,900,000	28,710,000	18,920,000	19,570,000
Trolley buses...............	....	....	....	....	....	1,560,000	2,075,000
Buses.......................	15,680,000	17,540,000	14,368,000	19,100,000	17,300,000	13,280,000	20,800,000
Power equipment.............	5,150,000	7,640,000	3,561,000	7,300,000	7,570,000	6,130,000	6,620,000
Total......................	$123,630,000	$116,380,000	$130,052,000	$135,350,000	$135,470,000	$124,500,000	$137,765,000

Maintenance Materials—Operating

	1925	1926	1927	1928	1929	1930	Forecast 1931
Way and structures...........	$56,900,000	$50,000,000	$40,517,000	$31,040,000	$35,800,000	$32,340,000	$31,980,000
Cars........................	54,700,000	47,800,000	36,941,000	35,200,000	36,350,000	35,710,000	34,970,000
Trolley buses...............	....	....	....	....	....	95,000	140,000
Buses.......................	7,370,000	7,500,000	9,451,000	15,040,000	17,925,000	18,025,000	18,470,000
Power equipment.............	22,650,000	11,370,000	8,310,000	9,100,000	10,460,000	10,520,000	10,840,000
Total......................	$141,620,000	$116,670,000	$95,219,000	$90,380,000	$100,535,000	$96,690,000	$96,400,000

Total of New Plant and Equipment, and Maintenance Materials

	1925	1926	1927	1928	1929	1930	Forecast 1931
Way and structures...........	$109,300,000	$101,200,000	$117,882,000	$121,090,000	$117,690,000	$116,950,000	$120,680,000
Cars........................	105,100,000	87,800,000	71,699,000	54,100,000	65,060,000	54,630,000	54,540,000
Trolley buses...............	....	....	....	....	....	1,655,000	2,215,000
Buses.......................	23,050,000	25,040,000	23,819,000	34,140,000	35,225,000	31,305,000	39,270,000
Power equipment.............	27,800,000	19,010,000	11,871,000	16,400,000	18,030,000	16,650,000	17,460,000
Grand total................	$265,250,000	$233,050,000	$225,271,000	$225,730,000	$236,005,000	$221,190,000	$234,165,000

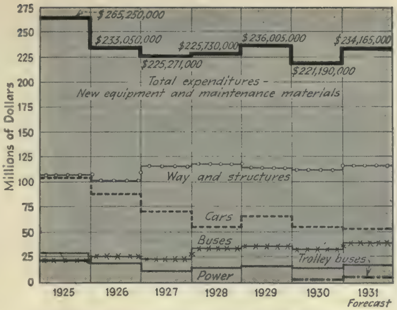
An extremely important factor which must not be overlooked is the change in costs as compiled in another article in this issue. Actual cost indexes show that electric railway operating materials dropped from 145.6 in 1929 to 136.9 in 1930, or 5.97 per cent. Electric railway construction costs likewise declined 1.78 per cent and general construction costs 2.03 per cent. These declines would indicate that, although expenditures for 1930 were under those of 1929, the actual amount of work done and betterments effected were almost as great for the past year as in 1929.

WAY AND STRUCTURES ACCOUNT INCREASES

Continued activity in the way and structures department resulted in an increase for 1930 of $2,720,000 over 1929, reaching the total of $84,610,000. This figure is a little under the high mark of $90,050,000 for 1928, but in excess of the amounts spent in 1925, 1926 and 1927. The increase is accounted for by the large mileage of track extensions and electrification, the several large track rebuilding programs and the erection of many shops and garages. Track extensions were about the same as last year, track reconstruction exceeded the previous figure slightly, while electrification of steam roads was far in excess of the 1929 figure. A large part of the gain is attributable to the erection of several costly shops.

A further increase of $4,070,000, bringing the total to $88,700,000, is forecast for 1931, indicating that there will be no curtailment of this activity. It appears that the electric railways are keeping their track up to the standard necessary for giving high-class service. Since track represents the greatest single item in the property valuation of electric railways, this forecast is particularly encouraging. Many large way and structures programs were indicated on the individual reports of companies for 1931. The five largest were for $5,581,000, $4,800,000, $1,928,000, $1,500,000 and $1,000,000. Five others ranged between $500,000 and $800,000. Actually, these amounts were $800,000, $650,000, $557,000, $500,000 and $500,000. The total of these ten programs alone amounts to $17,816,000. With eight smaller programs, amounting to $450,000, $449,000, $350,000, $250,000, $245,000, $221,000, $215,000 and $211,000, the total reaches $20,207,000.

The actual number of cars purchased in 1930 was approximately 23 per cent below the number for the previous year. As a result, the expenditures dropped from $28,710,000 to $18,920,000, a decrease of $9,790,000. The reduction in capital expenditure is greater in proportion than the actual number because of an order of 300 subway cars in 1929, costing more than $37,000 each. According to actual budgets for 1931, the figure for new cars will exceed that of 1930. Although the increase is only $650,000, it does indicate that buying activity will not fall below the 1930 level. More tangible evidence of continued purchasing is shown by actual orders planned. Six companies have budgeted for orders of 100, 100, 53, 50, 48 and 40, respectively. Six others have allowed for orders of 34, 25, 24, 20, 10 and 10. These twelve orders, totaling 514 cars, will entail an expenditure of $9,269,000. A number of other companies stated that they were purchasing less than ten cars, while others intimated that their budgets might be revised later to allow for the purchase of new cars.



Distribution of new equipment and maintenance material expenditures by individual accounts

Because of the great activity shown in trolley buses during 1930, this account was entered for the first time on the budget blanks submitted to the operators. Purchases of new vehicles reached such a high point that this particular phase of operation will be given consideration in all future statistical numbers. During the past year approximately 116 trolley buses were purchased, involving a sum of $1,560,000. This represents a very great increase over any previous year. In fact, the number bought during 1930 exceeded all the trolley buses in operation at the end of 1929. Budgets for 1931 actually allow for the purchase of approximately 150 vehicles at a cost of $2,075,000. Although some of these orders were described as being still uncertain, it is not unlikely that other companies will purchase vehicles under revised budgets. With the vehicles placed in service during the past year and those previously in operation, the trolley bus accounts represent a substantial investment.

Bus purchases suffered a lapse in 1930, dropping from 1,813 to approximately 1,600, or close to 11 per cent. This represents a decrease in capital expenditure of $4,020,000, from $17,300,000 to $13,280,000. Budgets for 1931, however, indicate a sizeable increase over this figure, mounting $7,520,000 to $20,800,000. This figure is higher than that given in any previous year, exceeding the high mark for 1928 of $19,100,000 by $1,700,000.

Actual orders to be placed by seven companies amount to 200, 82, 60, 46, 18, 15 and 10, respectively. A total of $4,178,000 was budgeted for these 431 vehicles. A large number of other companies indicated that they were purchasing a smaller number of buses.

Expenditures for power plant, substation and line equipment in 1930 amounted to $6,130,000, a decrease of $1,440,000. The maintenance of a figure in excess of the $6,000,000 mark is attributed partly to the great amount of steam road electrification during the past year, and the installation of several trolley bus systems. For 1931 an increase of $490,000 is budgeted, bringing the total to $6,620,000. Continued activity in electrifying steam roads and projected trolley bus extensions and new installations will account for a large portion of this amount.

Summing up the totals of new plant and equipment, charged to capital account, the figure of $124,500,000 is reached. This is less than the totals for 1927, 1928 and 1929, but in excess of the figures for 1925 and 1926. The total of $137,765,000 budgeted for 1931 will be in excess of any total for the six preceding years.

LITTLE CHANGE FOR MAINTENANCE

It was to be expected that, during a year of depression, there would be economies effected in the maintenance department. However, since this phase of operation is extremely important and most vital to successful operation, reductions for material and labor were made most judiciously and expenditures held to a minimum. Actually in 1930, the railways reduced their expenditures for maintenance materials and labor from $221,985,000 to

Maintenance Materials and Labor

		Way and Structures	Cars	Trolley Buses	Buses*	Power	Total
1927 Expenditures	Material	$40,517,000	$36,941,000	....	$9,451,000	$8,310,000	$95,219,000
	Labor	66,874,000	44,952,000	....	6,592,000	8,244,000	126,662,000
	Total	$107,391,000	$81,893,000	....	$16,043,000	$16,554,000	$221,881,000
1928 Expenditures	Material	$31,040,000	$35,200,000	....	$15,040,000	$9,100,000	$90,380,000
	Labor	50,400,000	49,300,000	....	11,870,000	6,580,000	118,150,000
	Total	$81,440,000	$84,500,000	....	$26,910,000	$15,680,000	$208,530,000
1929 Expenditures	Material	$35,800,000	$36,350,000	....	$17,925,000	$10,460,000	$100,535,000
	Labor	52,800,000	49,380,000	....	13,540,000	5,730,000	121,450,000
	Total	$88,600,000	$85,730,000	....	$31,465,000	$16,190,000	$221,985,000
1930 Expenditures	Material	$32,340,000	$35,710,000	$95,000	$18,025,000	$10,520,000	$96,690,000
	Labor	49,450,000	47,780,000	85,000	14,960,000	5,670,000	117,945,000
	Total	$81,790,000	$83,490,000	$180,000	$32,985,000	$16,190,000	$214,635,000
1931 Estimated expenditures	Material	$31,980,000	$34,970,000	$140,000	$18,470,000	$10,840,000	$96,400,000
	Labor	49,880,000	47,550,000	125,000	15,280,000	5,650,000	118,485,000
	Total	$81,860,000	$82,520,000	$265,000	$33,750,000	$16,490,000	$214,885,000

*Bus maintenance materials include replacement parts, tires and tubes.

	1929	1930	Forecast 1931
Bus operating supplies, including fuel and lubricants	$20,720,000	$21,880,000	$22,060,000

Outstanding Facts Revealed by the Budget Data

DURING 1930

The total for extensions, betterments and maintenance receded only $18,320,000, or 5.12 per cent.

Increases for way and structure, trolley bus and power capital accounts were shown.

Maintenance materials for trolley buses, buses and power exceeded the previous figures.

Way and structures and car maintenance fell below 1929, but the total for all maintenance held up well.

DURING 1931

The total for new plant and equipment, and maintenance will increase almost 4 per cent.

All capital accounts will register slight gains over the previous year.

The total for new vehicles will reach $42,445,000—an increase of $8,685,000 over 1930.

Maintenance materials will remain about the same, two accounts showing decreases and three accounts increases.

$214,635,000, a decrease of only 3.31 per cent. Of the total reduction $3,845,000 was accounted for in maintenance materials and $3,505,000 in maintenance labor.

Analysis of individual maintenance material accounts shows reductions for way and structures and cars, but increases for trolley buses, buses and power equipment. In both way and structures and cars the decreases were relatively small, the first being from $35,800,000 to $32,340,000 and the second from $36,350,000 to $35,710,000.

Because of the large increase in trolley buses during 1930, the total of $95,000 for maintenance materials represents a large increase over the previous year. Reports from the twelve companies now operating trolley buses showed almost uniform rates for maintenance for vehicles of the same age. Allotments for the older vehicles amounted to approximately $1,050 per vehicle per year, while for the newer vehicles this figure averaged approximately $840.

During 1931 a total of $140,000 will be spent for trolley bus maintenance materials. This represents an increase of $45,000, or 47.4 per cent. This big increase is accounted for by the large number which will be purchased during 1931, and the full year maintenance period for many of the vehicles purchased during 1930.

A new high mark of $18,025,000 was reached in 1930 for bus maintenance materials, including replacement parts, tires and tubes. This exceeds the 1929 mark by $100,000, and the 1928 figure by $2,985,000. More than 1,800 buses were purchased during 1929, which accounts for the increase in this item, in the face of curtailed service on many systems. Had the companies maintained their schedules as in previous years, the 1930 figure would have increased a great deal more. For 1931 another increase is allowed, bringing the total to $18,470,000. This steady rise is attributable not only to the greater number of vehicles in service, but also to the greater average age of the buses being used. It is reasonable to expect that for many years this particular account will continue to rise.

Bus operating supplies, including fuel and lubricants, reached the high total of $21,880,000 in 1930, exceeding the previous figure by $1,160,000. In 1931 a new mark of $22,060,000 will be established. This trend is in keeping with the steady increase in the number of buses operated.

Maintenance materials for power plant, substation and line equipment also showed an increase for 1930 over 1929. The total of $10,520,000 was $60,000 in excess of the previous figure. No doubt this increase is explained partly by the appropriations for maintaining the trolley bus overhead recently installed. A further increase of $320,000 is budgeted for 1931, bringing the total to $10,840,000.

MAINTENANCE LABOR DECREASES SLIGHTLY

Reductions in maintenance forces and shortening of working hours resulted in a reduction of the total for maintenance labor from $121,450,000 for 1929 to $117,945,000 for 1930. Way and structures, cars and power equipment showed decreases of $3,350,000, $1,600,000 and $60,000, respectively. An increase of $1,420,000 was shown for buses. Appropriations for trolley bus labor during 1930 amounted to $85,000. This figure is about 89.5 per cent of the amount spent for maintenance material. During 1931 all maintenance labor accounts will remain substantially the same, with the exception of trolley buses and buses. These two will register gains, $40,000 for trolley buses and $320,000 for buses.

Genealogy of "Electric Railway Journal"

ELECTRIC RAILWAY JOURNAL is a consolidation of *Street Railway Journal* and *Electric Railway Review,* effected in 1908.

In November, 1884, *Street Railway Journal* began publication, having been started a few months earlier as the street railway department of the *Journal of Railway Appliances.* The new paper was edited during various periods by Robert Grimshaw, George L. Fowler, Emerson P. Harris, C. B. Fairchild and Edward E. Higgins.

In May, 1908, *Electric Railway Review* was purchased and consolidated with *Street Railway Journal* to form ELECTRIC RAILWAY JOURNAL. Henry W. Blake, who joined the staff of *Street Railway Journal* in 1891 and in 1894 became its editor, continued as the editor of ELECTRIC RAILWAY JOURNAL until 1925, when he was made senior editor. Harold V. Bozell was co-editor from 1920 to 1922, and Harry L. Brown was co-editor from 1923 to January, 1925. Charles Gordon became editor in February, 1926, and continued in this capacity until October, 1929, when he resigned to accept the post of managing director of the American Electric Railway Association. John A. Miller, Jr., assumed editorial responsibility at that time and was appointed editor in August, 1930.

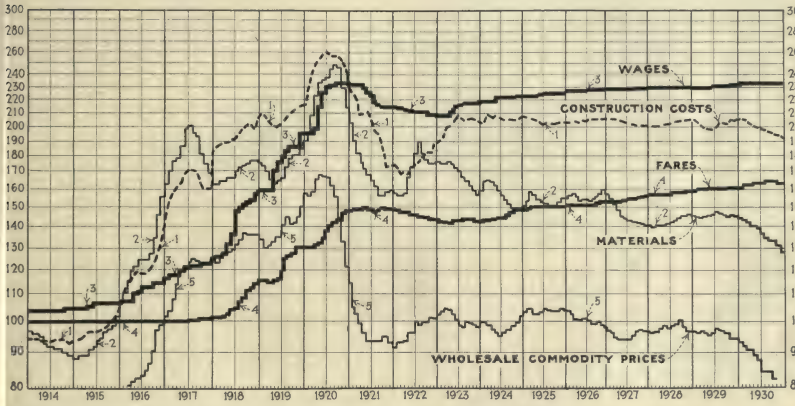
The present staff is as follows: John A. Miller, Jr., editor; Morris Buck, engineering editor; George J. MacMurray, news editor; and Clifford A. Faust, J. W. McCloy, Joseph R. Stauffer and Charles J. Roggi, assistant editors. Paul Wooton is Washington correspondent; W. C. Heston is Pacific Coast editor, and Alexander McCallum is London editorial representative.

FARES and WAGES Rise—COSTS Decline

During 1930

By
ALBERT S. RICHEY
Electric Railway Engineer
Worcester, Mass.

Weighted average street railway fare is now 7.77 cents. Wages have increased slightly. Construction costs and commodity prices have declined sharply

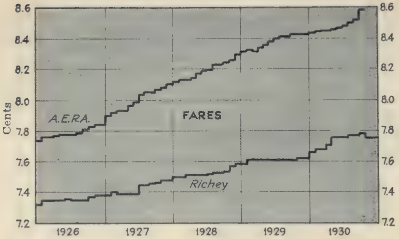


Trend of construction and operating costs, wages and fares, 1914—1930

1. Electric railway construction costs (according to American Electric Railway Association). 1913 = 100.
2. Electric railway operating materials costs (Richey). Includes fuel for power, weighted according to average use in maintenance and operation. 1913 = 100.
3. Electric railway wages (Richey). Maximum hourly wages of platform men, weighted according to number of men. 1913 = 100.
4. Street railway fares (Richey). U. S. cities (except New York), weighted according to population. 1913 = 100.
5. Wholesale commodity prices (U. S. Bureau of Labor Statistics). 1926 = 100.

CONTINUING the trend of former years, the weighted average street railway fare in the United States increased from 7.62 to 7.77 cents during 1930. This net change was due principally to increases in Milwaukee, Cleveland, Portland (Ore.), Baltimore, Washington, Kansas City and Denver. New Jersey cities had an increase in January and a corresponding decrease in November. Other changes have had little influence on the weighted average fare on account of the smallness of the change or the limited population affected. The 1930 net increase amounts to nearly 2 per cent compared with about one-half of 1 per cent increase in 1929 and about 1½ per cent increases in each of the years 1928, 1927 and 1926. The total increase in the last five years has been about 6½ per cent.

The foregoing figures are based on the Richey Fare Index, revised to the 1930 census figures as described in ELECTRIC RAILWAY JOURNAL, December, 1930, page 756. The average now includes 189 cities of 50,000 population and over, totaling nearly 36,000,000 population. In computing the average, fares in the individual cities are weighted in accordance with the population of the cities; further, for each city where reduced rate tickets are in effect, an average fare which includes both cash and ticket rates, is used; children's and workmen's tickets, or other forms of special reduced rates, are not



Street railway fares 1926-1930 (1913 = 4.8425 cents)

considered. New York City is excluded on account of its large population and abnormally low street railway fares.

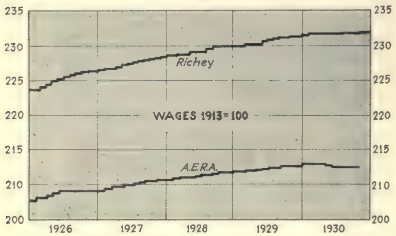
The trend of the Richey Fare Index for the past five years is shown in an accompanying chart which also shows the average fares as computed by the American Electric Railway Association. The A.E.R.A. average includes 247 cities of more than 25,000 population and is an average of cash fares only. It is not weighted, so that each city is of equal importance in the final average, regardless of its size and the number of patrons affected by the fare.

Indexes of the average wages of electric railway trainmen also continued their upward trend during 1930. In the accompanying chart two indexes are shown, both using 1913 as a base. In both indexes the maximum hourly rates of trainmen in two-man service are used. The Richey index includes hourly wages on 121 street and interurban railways, and is weighted in accordance with the number of trainmen employed on such railways. The American Electric Railway Association index is based on the simple average of rates of wages on 85 railways. Since the roads employing the greater number of men, as a rule, have made larger increases in hourly rates since 1913, the Richey weighted index stands somewhat higher than the unweighted A.E.R.A. index. The wage changes during 1930 which have principally affected the Richey index were at Los Angeles, Seattle, Portland (Ore.) and Wilmington. The changes during 1930 approximate an increase of about three-tenths of 1 per cent in the index; during the past five years there has been an increase of about 4 per cent.

A computation of an index of "real wages" of electric railway trainmen as compared with 1913 and 1914 may be made by dividing the index of wages by the index of the cost of living. This indicates an index of "real wages" (on the base of 1913-14) of 152.6 at the end of 1930, which may be compared with 142.7 at the end of 1929 and 141.8 at the end of 1928. These increases in the "real wages" index for street railway employees for the past several years are considerably greater than the increases in hourly rates of pay.

Annual Indexes of Fares and Costs
1913-1930

	Street Railway Fares (Richey)	Electric Railway Operating Materials Costs (Richey)	Electric Railway Wages (Richey)	Electric Railway Construction Costs (Am. Elec. Ry. Assn.)	General Construction Costs (*Eng. News Record*)	Wholesale Prices, All Commodities (U. S. Bur. Lab. Stat.
Base.......	1913	1913	1913	1913	1913	1926
1913.......	100.0	100.0	100.0	100.0	100.0	69.8
1914.......	100.0	92.6	104.2	94.0	88.6	68.1
1915.......	100.1	93.5	106.2	97.3	92.6	69.5
1916.......	100.1	126.2	111.6	119.8	129.6	85.5
1917.......	100.5	181.9	120.6	162.7	181.2	117.5
1918.......	106.2	168.8	140.5	192.5	189.2	131.3
1919.......	120.7	172.2	174.0	205.1	198.4	138.6
1920.......	137.2	224.6	217.3	244.7	251.3	154.4
1921.......	148.9	169.9	222.7	200.7	201.8	97.6
1922.......	146.0	170.0	210.0	175.2	174.4	96.7
1923.......	142.9	168.0	212.1	200.2	214.1	100.6
1924.......	149.2	156.0	219.2	204.6	215.4	98.1
1925.......	150.2	153.1	222.2	202.4	206.7	103.5
1926.......	151.9	155.0	225.3	202.6	208.0	100.0
1927.......	153.4	145.7	227.5	201.1	206.2	95.4
1928.......	155.5	142.2	229.3	203.1	206.8	97.6
1929.......	157.1	145.6	230.6	202.4	207.0	96.5
1930.......	159.9	136.9	231.7	198.8	202.8	....



Electric railway wages 1926-1930 (1913 = 100)

The trend of costs of electric railway operating materials has been markedly downward during 1930. The index based on 1913 costs stood at 144.9 in December, 1929, and has declined nearly 12 per cent to 127.8 in December, 1930. In the make-up of this index, fuel for power is included and enters into the index with a weighting of 40 per cent.

Electric railway construction costs have declined about 6½ per cent during 1930, with a net decline of about 5 per cent in the five-year period, as shown on the next page. This index is calculated on the formula of the American Electric Railway Association and as representing electric railway construction costs may be compared with the general construction cost index of the *Engineering News-Record,* which is also shown for the past five-year period. The general construction cost index has shown a drop of 6 per cent during 1930, and of 4.4 per cent in the five-year period. The general construction cost index includes structural steel and other building materials in a considerably greater weighting than such items enter into the electric railway construction cost index, which latter also is somewhat stabilized by the heavier weighting of steel rail, the price of which has remained constant since October, 1922. The electric railway index, however, has a very much heavier weighting of the common labor item, the average cost of which decreased somewhat during 1930.

The Wholesale Commodity Index of the United States Bureau of Labor Statistics is shown for the last five years. During 1930 it has shown a decline of nearly 15 per cent, with a net decline of more than 22 per cent during the past five years. This index is the only one of those presented here which has a base other than the year 1913. The base of 1913 = 100 for the Wholesale Commodity Index was discontinued in August, 1927, and since then it has been calculated on the base of 1926 = 100, and is so shown in the accompanying tables and charts.

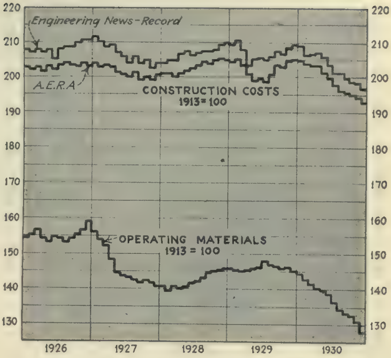
Whether or not the substantial reductions in costs of commodities in 1930 are temporary or permanent re-

Monthly Indexes of Fares and Costs for Past Five Years

	Street Railway Fares (Richey)	Electric Railway Operating Materials Costs (Richey)	Electric Railway Wages (Richey)	Electric Railway Construction Costs (Am. Elec. Ry. Assn.)	General Construction Costs (*Eng. News Record*)	Wholesale Prices, All Commodities (U. S. Bur) Lab. Stat.
Base.......	1913	1913	1913	1913	1913	1926
1926						
January....	151.2	154.3	223.8	202.2	207.2	103.6
February...	151.7	155.3	223.8	201.9	206.6	102.1
March.....	151.8	156.4	224.1	202.0	207.6	100.4
April.......	151.8	154.2	224.7	201.3	207.0	100.1
May.......	151.8	153.1	225.4	202.4	207.3	100.5
June.......	151.9	154.4	225.5	201.9	204.8	100.5
July.......	151.8	154.1	225.7	203.2	207.8	99.5
August.....	151.8	153.1	225.9	203.6	208.3	99.0
September..	151.8	154.2	226.1	203.2	208.3	99.7
October....	152.2	155.4	226.2	202.9	209.8	99.4
November..	152.5	156.6	226.3	203.7	210.8	98.4
December..	152.5	159.2	226.3	203.2	210.8	97.9
1927						
January....	152.5	156.0	226.6	203.5	211.5	96.6
February...	152.8	154.0	226.7	202.9	210.2	95.9
March.....	152.7	152.1	226.7	203.0	208.8	94.5
April.......	152.7	148.0	226.9	202.6	209.0	93.7
May.......	152.7	144.2	227.4	201.0	206.8	93.7
June.......	152.7	143.0	227.5	200.6	205.6	93.8
July.......	153.9	142.9	227.8	199.9	203.7	94.1
August.....	153.9	142.1	227.9	200.9	205.5	95.2
September..	154.0	141.6	228.0	199.4	203.6	96.5
October....	154.1	141.8	228.2	199.8	204.4	97.0
November..	154.5	141.3	228.3	199.4	202.0	96.7
December..	154.5	140.6	228.4	200.7	203.9	96.8
1928						
January....	154.8	140.6	228.6	200.9	203.9	96.3
February...	154.8	139.5	228.7	200.9	204.6	96.4
March.....	155.3	140.1	228.8	200.5	204.6	96.0
April.......	155.3	140.0	228.8	201.2	206.4	97.4
May.......	155.3	140.4	229.2	201.9	207.0	98.6
June.......	155.3	141.4	229.2	202.7	206.2	97.6
July.......	155.4	141.8	229.2	203.3	206.6	98.3
August.....	155.6	142.5	229.7	204.5	207.3	98.9
September..	155.6	144.2	229.7	204.4	207.3	100.1
October....	155.7	144.9	229.9	205.5	207.7	97.8
November..	156.3	145.1	229.9	205.7	209.5	96.7
December..	156.6	145.5	229.8	205.1	210.2	96.7
1929						
anuary....	156.6	145.3	229.9	204.5	209.4	97.2
February...	157.1	145.0	229.9	205.2	210.4	96.7
March.....	157.1	144.8	230.1	203.4	207.8	97.5
April.......	157.1	145.0	230.1	200.9	203.4	96.8
May.......	157.1	145.5	230.1	199.5	205.2	95.8
une.......	157.1	145.8	230.8	199.7	205.6	96.4
uly.......	157.1	147.5	230.8	199.0	204.8	98.0
August.....	157.1	146.4	231.0	200.8	205.9	97.7
September..	157.1	146.1	231.0	203.4	207.6	97.5
October....	157.1	145.6	231.1	203.0	206.3	96.3
November..	157.4	145.7	231.1	204.8	208.5	94.4
December..	157.4	144.9	231.1	205.1	209.5	94.2
1930						
anuary....	158.4	144.4	231.3	204.5	209.0	93.4
February...	158.7	142.9	231.7	203.6	206.5	92.1
March.....	158.7	141.6	231.7	203.0	206.8	90.8
April.......	159.3	140.2	231.7	203.0	207.1	90.7
May.......	160.3	139.9	231.7	201.1	205.9	89.1
une.......	160.4	138.9	231.7	199.5	203.4	86.8
ulv.......	160.4	136.2	231.7	197.7	201.0	84.0
August...	160.6	134.2	231.8	196.1	201.0	84.0
eptember..	160.6	133.0	231.8	195.6	199.6	84.2
October....	160.8	132.7	231.8	195.1	198.7	82.6
November..	160.2	130.9	231.8	194.1	198.5	80.4
December..	160.4	127.8	231.8	192.0	196.9	....

mains to be indicated by the future. Many economists have expressed the opinion that the declines of the past year are greater than are warranted by existing conditions, and that prices will return to higher levels as irregular factors are corrected.

Five of the indexes mentioned above have been grouped together for the years 1914 through 1930, inclusive, in the chart appearing at the beginning of this article. The indexes there shown are: (1) The American Electric Railway Association Index of Electric Railway Construction Costs, (2) the Richey Index of Electric Railway Operating Materials Cost, (3) the Richey Index of Electric Railway Wages, (4) the Richey Index of Street Railway Fares, and (5) the U. S. Bureau of

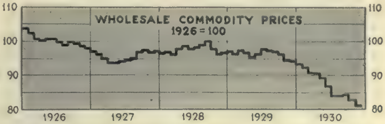


Costs of operating materials and construction (1913 = 100)

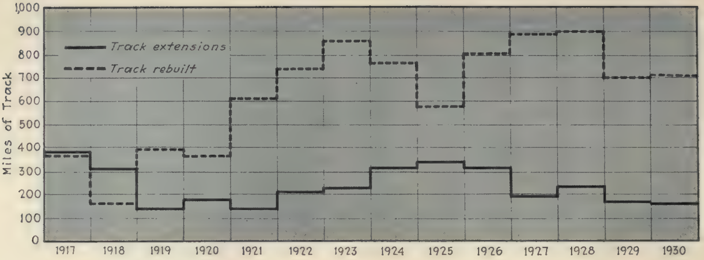
Labor Statistics Index of Wholesale Commodity Prices. The tabulation of numerical values includes these five and also the *Engineering News-Record* Index of General Construction Costs. The tabulation shows the averages of these indexes by years from 1913 through 1930, and also the monthly values from January, 1926, through 1930. It will be noted that all of the indexes are on the base of 1913 = 100 except the Wholesale Commodity Price Index, which, as above stated, is on the base of 1926 = 100.

All of the above-mentioned indexes are included in a series of index numbers compiled regularly by the writer under the heading of "Conspectus of Indexes" and published monthly in the JOURNAL. The conspectus also includes the Bradstreet Wholesale Commodity Index, the U. S. Bureau of Labor Statistics Index of Retail Food Costs, the National Industrial Conference Board's Index of Cost of Living, the *Electrical World's* Industrial Activity Index, an index of bank clearings outside of New York City, and data on the number and total liabilities of business failures as reported monthly by Bradstreet.

In the annual statistical numbers of the JOURNAL (the first or second issue in January each year beginning in 1923) charts and tables have been presented similar to those shown in this article. The methods used in the computation of the indexes were described fully on page 37 of the JOURNAL for Jan. 2, 1926, in an article which also contained a tabulation showing the numerical values of the various indexes monthly from January, 1920, through December, 1925. The earlier monthly numerical values, from January, 1914, through December, 1919, may be found on page 19 of the JOURNAL for Jan. 5, 1924.



Bureau of Labor Statistics wholesale commodity prices (1926 = 100)



Trend of track extensions and reconstruction by electric railways since 1917

Track Activity Well Sustained

Figures for 1930 show moderate gain over those for previous years. Sixty-five railways report extensions totaling approximately 150 miles of track. Mileage of track rebuilt exceeds figure for previous year. Abandonments continue in interurban territory and in small cities

TRACKWORK carried out by the electric railways during 1930 was slightly greater in volume than that done during 1929. Of particular significance is the fact that 65 companies report the construction of extensions totaling 153.01 miles. Nearly two hundred companies report a total of more than 700 miles of track rebuilt during the year just ended. At the same time nearly 400 miles of steam railroad track was electrified. Way and structure expenditures of the industry for new construction and maintenance were slightly more than $165,000,000.

The greatest amount of track extension occurred in the large cities. In Chicago the City Railway extended 11.50 miles and the Chicago Railways 3.69 miles, making the total increase for the Surface Lines system 15.19 miles. An increase of 6.15 miles was reported by the Philadelphia Rapid Transit Company. In Detroit the Department of Street Railways added 12.61 miles to its trackage. Another large city extension was that made at Milwaukee, where 15.52 miles of track were added.

Numerous track extensions were made also in the interurban field. Nearly 15 miles were added by the Sacramento Northern Railway, approximately 10 miles by the Pacific Electric Railway and 5.57 miles by the South Shore Line.

Reconstruction of track was carried out on a comparatively large scale in many cities. Those reporting more than 10 miles of track rebuilt during the past year include Denver, Chicago, Detroit, the Twin Cities, Philadelphia, Pittsburgh, Montreal and Brooklyn. Other important construction programs were completed in Atlanta, Indianapolis, New Orleans, Bangor, Baltimore, Boston, St. Louis, Cincinnati, Providence, Memphis, Dallas, Richmond and Milwaukee.

Comparison of Track Construction by Years

	Track Extensions		Track Rebuilt	
Year	Number of Companies	Miles	Number of Companies	Miles
1908	157	1,174.5	(*a*)	(*a*)
1909	160	774.7	(*a*)	(*a*)
1910	217	1,204.8	(*a*)	(*a*)
1911	223	1,105.0	(*a*)	(*a*)
1912	171	869.4	(*a*)	(*a*)
1913	181	974.9	(*a*)	(*a*)
1914	163	716.5	(*a*)	(*a*)
1915	136	596.0	(*a*)	(*a*)
1916	104	356.30	(*a*)	(*a*)
1917	121	376.70	150	375.40
1918	80	313.82	81	155.43
1919	73	140.57	148	389.89
1920	87	176.56	131	361.77
1921	78	147.10	184	615.21
1922	104	211.38	212	739.70
1923	132	233.15	241	854.63
1924	112	312.08	218	764.33
1925	100	339.79	179	578.90
1926	95	317.96	...	802.52
1927	95	192.41	212	887.94
1928	103	238.94	216	894.73
1929	81	167.71	190	700.14
1930	65	153.01	184	729.59

(*a*) Information not available.

Reconstruction of open track was carried out on an

Track Extensions in 1930

Name of Company	Miles
Alabama	
Birmingham Elec. Co.	4.36
California	
Los Angeles Ry	3.16
Pacific Elec. Ry	9.86
Pacific Gas & Elec. Co.	0.12
Sacramento Northern Ry	14.98
Colorado	
Denver Tramway	*4.07
*Purchased from Denver & Intermountain R.R.	
District of Columbia	
Washington Ry. & Elec. Co	0.01
Georgia	
Georgia Pwr. Co., (Atlanta)	0.28
Illinois	
Chicago, Aurora & Elgin R.R.	0.93
Chicago City Ry	11.50
Chicago & Illinois Valley R.R.	2.45
Chicago & Joliet Elec. Ry	0.32
Chicago, North Shore & Milwaukee R.R.	0.73
Chicago Rys	3.69
Chicago & West Towns Ry	2.50
East St. Louis Ry	0.10
Rockford Elec. Co	0.36
Indiana	
Chicago, South Shore & South Bend R.R.	5.57
Indianapolis St. Ry	0.72
Iowa	
Waterloo, Cedar Falls & Northern Ry	0.15
Kentucky	
Cincinnati, Newport & Covington Ry	0.09
Louisville Ry	0.36
Louisiana	
New Orleans Public Service, Inc.	0.22
Maine	
Bangor Hydro-Elec. Co	0.12
Maryland	
United Rys. & Elec. Co. of Baltimore	1.25
Massachusetts	
Boston Elevated Ry	0.45
Worcester Consolidated St. Ry	0.17
Michigan	
City of Detroit, Dept. of St. Rys	12.61
Eastern Michigan Rys	2.62
Minnesota	
Twin City Rapid Transit Co	3.73
Missouri	
St. Francois County R.R.	0.12
St. Louis Public Service Co	0.65
New Jersey	
Trenton Transit Co	0.13
New York	
New York & Queens County Ry	0.92
Niagara Junction Ry	0.27
Steinway Ry	0.23
Third Avenue Ry	1.07
Ohio	
Cleveland Ry	1.26
Columbus Ry., Pwr. & Lt. Co	0.98
Ohio Public Service Co	0.50
Shenango Valley Traction Co	0.19
Youngstown & Suburban Ry	6.50
Oklahoma	
Northeast Oklahoma R.R.	1.87
Sand Springs Ry	5.98
Oregon	
Pacific Northwest Public Service Co	0.22
Pennsylvania	
Altoona & Logan Valley Elec. Ry	0.33
Beaver Valley Traction Co	0.15
Harrisburg Ry	0.96
Philadelphia Rapid Transit Co	6.15
Pittsburgh Rys	0.60
Tennessee	
Memphis St. Ry	0.11
Texas	
Dallas Ry. & Terminal Co	1.83
Utah	
Salt Lake & Utah R.R.	0.75
Virginia	
Virginia Elec. & Pwr. Co	2.78
Washington	
Seattle Municipal St. Ry	0.99
Spokane, Coeur d'Alene & Palouse Ry	0.11
Wisconsin	
Milwaukee Elec. Ry. & Lt. Co	15.52
Wisconsin Pw. & Lt. Co	5.00
Canada	
Hydro Elec. Rys	0.50
Montreal Tramways	4.37
New Brunswick Pwr. Co	0.50
Oshawa Ry	0.13
Saskatoon Municipal Ry	0.98
Toronto Transportation Commission	2.75
Winnipeg Elec. Co.	0.13
	153.01

extended scale by the Sacramento Northern Railway, the Tidewater Southern Railway, the Chicago, Aurora & Elgin, the South Shore Line, and others. In all, the reconstruction of open track totaled nearly 300 miles or considerably more than the 1929 total. Reconstruction of track in paved street totaled 442.10 miles, which is slightly less than the preceding year.

Abandonment of electric railway track again amounted to a large total. The trackage abandoned by railways which continued to operate rail service elsewhere on their systems amounted to almost exactly 1,000 miles. Bus service was substituted for rail service on about 40 per cent of this mileage. In three instances trolley bus service was substituted for the rail service. Track abandoned by companies which discontinued rail service altogether totaled a little more than 400 miles. Bus service was substituted on approximately three-fourths of this abandoned mileage.

Analyzing the 21 complete abandonments of track for the year it is found that twelve served suburban or

Several important extensions were made during 1930 by the Chicago Surface Lines. The above shows construction along 87th Street

Reconstruction of tracks on the Grand River line was part of the extensive track work completed by Detroit during the past year

Track Reconstruction in 1930

	Miles	
Name of Company	Paved	Open
Alabama		
Alabama Pwr. Co. (Anniston)	1.01	.....
(Gadsden)	0.91	0.34
(Montgomery)	0.70	.....
(Tuscaloosa)	0.08	0.08
Birmingham Elec. Co.	2.01	4.15
Mobile Lt. & R.R. Co.	1.45	1.33
Arkansas		
Arkansas Pwr. & Lt. Co. (Little Rock)	0.96	.....
Texarkana St. Ry	.....	0.50
California		
East Bay St. Ry	0.54	.....
Key System Ltd	0.04	.....
Los Angeles Ry	4.66	.....
Market St. Ry., San Francisco	0.25	.....
Municipal Ry. of San Francisco	2.36	0.07
Pacific Elec. Ry	3.34	3.97
Sacramento Northern Ry	.....	63.60
San Diego Elec. Ry	1.15	.....
Southern Pacific Co. (East Bay)	.....	1.00
Tidewater Southern Ry	0.25	20.00
Colorado		
Denver & Intermountain R.R.	.....	0.02
Denver Tramway	13.68	1.05
Connecticut		
Connecticut Co.	3.80	0.15
Delaware		
Delaware Elec. Pwr. Co.	.....	0.50
District of Columbia		
Arlington & Fairfax Ry	.....	6.00
Capital Traction Co.	2.58	.....
Mt. Vernon, Alexandria & Washington Ry	0.50	2.00
Washington Ry. & Elec. Co	4.63	.....
Florida		
Tampa Elec. Co.	0.44	.....
Georgia		
Georgia Pwr. Co., (Atlanta)	5.90	.....
Savannah Elec. & Pwr. Co.	0.04	0.13
Illinois		
Calumet & South Chicago Ry	3.14	.....
Chicago, Aurora & Elgin R.R.	.....	11.85
Chicago City Ry	9.99	.....
Chicago Rys	11.22	.....
Chicago Rapid Transit Co.	.....	6.12
Chicago & West Towns Ry	1.00	.....
Illinois Pwr. & Lt. Corp. (Champaign)	0.59	.....
(Danville)	0.19	.....
(Peoria)	1.35	.....
Rockford Elec. Co.	0.36	.....
Southern St. Ry	0.08	.....
Indiana		
Chicago, South Shore & South Bend R.R.	4.52	26.18
Gary Rys	1.00	.....
Indianapolis St. Ry	6.06	0.27
Northern Indiana Ry	0.50	.....
Southern Indiana Gas & Elec. Co.	0.76	0.50
Kansas		
Arkansas Valley Interurban Ry	.....	0.64
Kansas City, Leavenworth & Western R.R.	0.12	.....
Wichita Transp. Co.	0.50	.....
Kentucky		
Cincinnati, Newport & Covington Ry.	3.42	0.15
Kentucky Traction & Terminal Co.	0.25	.....
Louisville Ry	1.39	0.72
Louisiana		
New Orleans Public Service, Inc.	6.41	.....
Shreveport Rys	0.15	.....
Maine		
Androscoggin & Kennebec Ry	0.89	.....
Bangor Hydro-Elec. Co	8.07	.....
Biddeford & Saco R.R.	.....	0.15
Central Maine Pwr. Co.	.....	0.70
Cumberland County Pwr. & Lt. Co.	5.00	.....
Waterville, Fairfield & Oakland Ry	.....	0.20
Maryland		
United Rys. & Elec. Co., Baltimore	4.00	8.00
Massachusetts		
Athol & Orange Transportation Area	4.28	.....
Berkshire St. Ry	0.29	.....
Boston Elevated Ry	6.37	0.88
Boston, Revere Beach & Lynn R.R.	.....	3.00
Eastern Massachusetts St. Ry	5.59	1.02
Fitchburg & Leominster St. Ry	.....	1.00
Springfield St. Ry	.....	32.00
Union St. Ry	0.50	.....
Worcester Consolidated St. Ry	0.98	.....
Michigan		
City of Detroit, Dept. of St. Rys	22.37	0.37
Eastern Michigan Toledo R.R.	0.46	.....
Minnesota		
Twin City Rapid Transit Co.	12.35	.....
Mississippi		
Mississippi Pwr. & Lt. Co. (Jackson)	.....	1.30
(Vicksburg)	.....	0.14
Missouri		
Springfield Traction Co.	.....	0.50
St. Joseph Ry., Lt., Ht. & Pwr. Co.	2.92	.....
St. Louis Public Service Co.	6.17	3.08
Montana		
Anaconda Copper Mining Co.	.....	0.70
Nebraska		
Omaha & Council Bluffs St. Ry	0.40	.....
New Hampshire		
Berlin St. Ry	.....	0.04
Claremont Ry	.....	3.00
Public Service Co. of New Hampshire	.....	2.50
New Jersey		
Five Mile Beach Elec. Ry	0.20	0.10
Public Service Co-ord. Transport	18.00	.....
Trenton Transit Co.	2.51	0.15
New York		
Brooklyn & Queens Transit Corp.	20.00	.....
Buffalo & Lackawanna Traction Co.	1.00	.....
International Ry	7.00	.....
Jamestown St. Ry	2.30	.....
New York & Harlem R.R.	0.51	.....
New York Rys	0.38	.....
New York State Rys. (Rochester)	3.61	.....
(Syracuse)	0.83	.....
(Utica)	0.54	.....
Niagara Junction Ry	.....	0.50
Schenectady Ry	1.01	.....
Third Avenue Ry	13.98	.....
Triple Cities Traction Corp	0.82	.....
United Traction Co., Albany	0.61	.....
Ohio		
Akron Transp. Co	2.66	.....
Cincinnati & Lake Erie R.R.	1.00	0.45
Cincinnati St. Ry	7.60	.....
City Ry. Dayton	1.00	.....
Cleveland Ry	16.49	0.01
Columbus Ry., Pwr. & Lt. Co.	1.99	.....
Community Traction Co., Toledo	2.05	.....
Lake Shore Electric Ry	.....	0.21
Lancaster Traction & Pwr. Co.	7.00	5.00
Northern Ohio Interurban Co	0.57	0.67
Portsmouth Public Service Co.	0.31	.....
Shenango Valley Traction Co.	0.19	.....
Steubenville, East Liverpool & Beaver Valley Traction Co.	0.75	.....
Toledo & Indiana R.R.	.....	6.00
Youngstown Municipal Ry	2.53	.....
Oklahoma		
Muskogee Elec. Traction Co.	0.25	.....
Oklahoma Ry	1.37	.....
Sand Springs Ry	.....	2.00
United Service Co., Tulsa	2.00	.....
Oregon		
Pacific Northwest Public Service Co.	4.20	0.24
Pennsylvania		
Altoona & Logan Valley Elec. Ry	0.55	.....
Beaver Valley Traction Co.	0.59	.....
Conestoga Traction Co	1.08	.....
East Penn Traction Co.	0.90	.....
Erie Rys	0.61	.....
Harrisburg Ry	2.89	.....
Hershey Transit Co.	.....	2.00
Indiana County St. Rys	.....	1.00
Johnstown Traction Co.	3.50	.....
Lehigh Valley Transit Co.	2.53	.....
Philadelphia Rapid Transit Co.	22.68	0.25
Pittsburgh Rys	13.93	2.55
Reading Transit Co.	1.07	1.14
Scranton Ry	1.71	....
Southern Penn Traction Co.	0.73	.....
Webster, Monessen, Belle Vernon & Fayette City Ry	1.00	.....
West Penn Rys	1.12	0.58
York Rys	0.80	.....
Rhode Island		
United Elec. Rys., Providence	7.78	.....
South Carolina		
South Carolina Pwr. Co., Charleston	0.45	.....
Tennessee		
Memphis St. Ry	6.14	0.26
Tennessee Public Service Co.	0.09	.....
West Tenn. Pwr. & Lt. Co.	0.35	.....
Texas		
Dallas Ry. & Terminal Co.	4.46	0.34
Eastern Texas Elec. Co.	0.05	0.35
El Paso Elec. Co	0.23	.....
Houston Elec. Co	2.93	.....
San Antonio Public Service Co.	0.10	.....
Utah		
Bamberger Elec. R.R.	.....	0.45
Salt Lake & Utah R.R.	.....	1.10
Virginia		
Lynchburg Traction & Lt. Co.	1.00	.....
Roanoke Ry. & Elec. Co.	0.35	.....
Virginia Elec. & Pwr. Co.	6.40	.....
Virginia Public Service Co.	0.24	.....
Washington		
Puget Sound Pwr. & Lt. Co. (Northern Dist.)	0.01	.....
Seattle Municipal St. Ry	0.63	.....
Seattle & Rainier Valley Ry	1.00	.....
Tacoma Ry. & Pwr. Co.	0.65	.....
West Virginia		
Charleston Interurban R.R.	1.00	.....
Monongahela West Penn Public Service Co.	0.07	.....
Tri-City Traction Co.	0.50	1.25
Wheeling Public Service Co.	0.40	0.16
Wheeling Traction Co.	0.65	1.07
Wisconsin		
Madison Rys	0.72	.....
Milwaukee Elec. Ry. & Lt. Co.	7.23	7.87
Wisconsin Pwr. & Lt. Co.	0.50	1.20
Hawaiian Islands		
Honolulu Rapid Transit Co.	0.45	.....
Canada		
British Columbia Elec. Ry.	0.54	0.32
Brandon Municipal Elec. St. Ry.	0.50	.....
Calgary Municipal Ry	0.38	.....
Cornwall St. Ry	0.35	.....
Edmonton Radial Ry.	2.00	.....
Hydro Elec. Rys	.....	34.65
Lethbridge Municipal St. Ry	.....	0.50
Levis Tramways	3.00	.....
London St. Ry	0.20	.....
Montreal Tramways	14.85	1.41
New Brunswick Pwr. Co.	.....	0.50
Newfoundland Lt. & Pwr. Co.	1.00	.00
Ottawa Elec. Ry	2.00	.....
Three Rivers Traction Co.	0.80	.....
Toronto Transportation Commission	4.22	.....
Sherbrooke Ry. & Pwr. Co.	0.15	.....
Winnipeg Elec. Co.	1.86	.....
Winnipeg, Selkirk & Lake Winnipeg Co.	.....	1.31
	442.10	287.49

interurban territory and nine were purely local systems. The total population of the communities formerly served by the latter was approximately 160,000. None of these communities has a population greater than 50,000; the average is slightly above 18,000. The total mileage abandoned by these local systems amounted to 51.60 miles, or an average of 5.73 miles per system. As the average mileage of track for all companies in the country is above 60 miles, the companies abandoned completely during the past year were comparatively small systems.

On the other hand, the work done by the large companies in the country represents a truer picture of the trend in the electric railway industry. Twenty of the largest systems in the country, all operating in cities above 200,000, expended during the last year more than $28,000,000 for way and structures. These companies operate only about 15 per cent of the existing mileage, but expended more than 30 per cent of the total expenditures by all operating companies for way and structures.

Track reconstruction carried on by these companies amounted to 209 miles, and extensions made during the year totaled 60 miles. These figures represent 30 and 39 per cent, respectively, of the totals of reconstruction and extensions reported by all companies. From the reports received from both large and small companies it can be seen that track construction and maintenance continues to be one of the major activities of the industry.

Total Abandonments

Name of Company	Miles of Track
Auburn & Syracuse Elec. R.R.	55.30
Buffalo & Williamsville Elec. Ry	6.60
*Detroit & Port Huron Shore Line Ry	125.89
*Durham Public Service Co.	9.53
Enid City Railway	6.92
*Fort Madison St. Ry	3.50
Hannibal Ry. & Elec. Co.	6.50
*Illinois Pwr. & Lt. Corp. (Jacksonville)	5.27
Kaydeross R.R., Ballston	15.00
*Kingston Consolidated R.R.	5.16
Kingston, Portsmouth & Cataraqui Elec. Ry	8.00
*Louisiana Pwr. & Lt. Co	6.26
*Massachusetts Northeastern St. Ry	57.74
*Middlesex & Boston St. Ry	12.09
Mississippi Valley Elec. Co.	5.00
Niagara, Welland & Lake Erie Ry	1.59
*Pacific Coast Ry	11.32
*Pictou County Elec. Co., Ltd.	6.20
St. Augustine Co.	4.74
Toledo, Bowling Green & Southern Trac. Co.	71.00
Willapa Elec. Co	5.64
	430.25

*Bus service substituted under the same management.

Partial Track Abandonments in 1930

Name of Company	Miles
Alabama	
Alabama Pwr. Co. (Gadsden)	1.20
(Sheffield)	3.45
Birmingham Elec. Co.	0.15
California	
East Bay St. Ry	1.30
Los Angeles Ry	1.25
Market St. Ry., San Francisco	3.62
Pacific Elec. Ry	43.29
Peninsula Ry	1.52
Sacramento Northern Ry	0.29
San Diego Elec. Ry	3.75
Colorado	
Colorado Springs & Interurban Ry	1.37
Denver & Intermountain R.R.	*4.07
Denver Tramway	7.14
Connecticut	
Connecticut Co.	31.91
Delaware	
Delaware Elec. Pwr. Co.	1.84
District of Columbia	
Mt. Vernon, Alexandria & Washington Ry.	9.50
Washington Ry. & Elec. Co.	5.71
Georgia	
Georgia Pwr. Co. (Athens)	9.37
(Atlanta)	0.24
Savannah Elec. & Pwr. Co.	0.02
Illinois	
Chicago & Illinois Valley R.R.	13.30
Chicago North Shore & Milwaukee R.R.	0.19
Illinois Pwr. Co.	2.60
Illinois Pwr. & Lt. Corp (Champaign)	4.10
(Decatur)	10.11
(Peoria)	1.74
(Quincy)	4.62
Rockford Elec. Co.	5.00
Indiana	
Indianapolis St. Ry	0.62
Terre Haute, Indianapolis & Eastern Traction Co.	187.75
Iowa	
Iowa Southern Utilities Co (Ottumwa Div.)	13.00
Ft. Dodge, Des Moines & Southern R.R.	1.19
Waterloo, Cedar Falls & Northern Ry	0.40
Kansas	
Joplin & Pittsburg Ry	23.00
Kentucky	
Louisville Ry	4.07
Louisiana	
New Orleans Public Service, Inc.	21.46
Maine	
Bangor Hydro-Elec. Co.	0.55
Maryland	
Potomac Edison Co.	0.87
United Rys. & Elec. Co., Baltimore	1.60
Massachusetts	
Berkshire St. Ry	58.06
Boston Elevated Ry	15.05
Eastern Massachusetts St. Ry	32.36
Interstate St. Ry	14.00
Springfield St. Ry	1.21
Worcester Consolidated St. Ry	3.28
Michigan	
Twin City R.R.	6.85
City of Detroit, Dept. of St. Rys	2.10
Eastern Michigan Rys	7.48
Eastern Michigan Toledo R.R.	1.13
Minnesota	
Duluth St. Ry	1.30
Twin City Rapid Transit Co.	1.12
Missouri	
St. Louis Public Service Co.	3.26
Nebraska	
Omaha & Council Bluffs St. Ry	0.70
New Hampshire	
Claremont Ry	2.81
New Jersey	
Coast Cities Ry	4.43
Trenton Transit Co.	0.22
New York	
Fonda, Johnstown & Gloversville R.R.	14.49
International Ry	5.00
Jamaica Central Rys.	3.31
New York State Rys. (Rochester)	46.25
(Syracuse)	2.20
(Utica)	8.01
Schenectady Ry	4.37
Southern New York Ry	4.00
Steinway Ry	0.01
Third Avenue Ry	4.91
Triple Cities Traction Corp.	2.66
North Carolina	
Tide Water Pwr. Co.	0.65
North Dakota	
Grand Forks St. Ry	0.40
Ohio	
Canton Traction Co.	5.24
Cincinnati St. Ry	6.43
Cleveland Ry	1.73
Community Traction Co., Toledo	2.46
Dayton & Troy Elec. Ry	3.31
Oakwood St. Ry	0.02
Pioneer Transp. Co.	4.50
Scioto Valley Ry. & Pwr. Co.	71.76
Oklahoma	
Northeast Oklahoma R.R.	0.28
Oklahoma Ry	0.76
Oregon	
Pacific Northwest Public Service Co.	0.88
Pennsylvania	
Beaver Valley Traction Co.	0.41
East Penn Traction Co.	13.50
Erie Rys.	8.18
Philadelphia Rapid Transit Co.	1.55
Pittsburgh Rys.	1.32
Reading Transit Co.	1.59
Scranton Ry	0.09
Southern Penn Traction Co.	13.14
West Penn Rys.	1.03
Rhode Island	
United Elec. Rys., Providence	20.74
South Carolina	
South Carolina Pwr. Co., Charleston	0.45
Tennessee	
Memphis St. Ry	0.03
Tennessee Public Service Co., Knoxville	3.78
Texas	
Eastern Texas Elec. Co.	1.39
El Paso Elec. Co.	3.40
Houston Elec. Co.	0.11
Northern Texas Traction Co.	3.40
San Antonio Public Service Co.	0.98
Utah	
Salt Lake & Utah R.R.	0.15
Utah Lt. & Traction Co.	0.84
Virginia	
Virginia Public Service Co.	1.69
Virginia Elec. & Pwr. Co.	1.20
Washington	
Seattle Municipal St. Ry	0.28
Spokane UnitedRys	0.39
Spokane, Coeur d'Alene & Palouse Ry	4.63
Tacoma Ry. & Pwr. Co.	0.99
Yakima Valley Transp. Co.	1.47
West Virginia	
Monongahela West Penn Public Service Co.	1.08
Wisconsin	
Lake Superior District Pwr. Co.	1.00
Milwaukee Elec. Ry. & Lt. Co.	0.47
Mississippi Valley Pub. Serv. (La Crosse Div.)	1.26
Wisconsin Pwr. & Lt. Co.	45.44
Canada	
Cape Breton Elec. Co.	5.53
Hydro Elec. Rys.	1.05
London St. Ry	6.47
Montreal Tramways	0.89
Oshawa Ry	0.12
Toronto Transportation Commission	2.11
Toronto Transp. Com. Radial Lines	48.55
	976.85

* Sold to Denver Tramway

Rapid Transit Makes Advance

Comparatively little new track is added during the year, but the way is paved for important increases in New York, Chicago, Newark and Cleveland

INTEREST in rapid transit was unabated during the year, particularly in the larger metropolitan centers. Naturally, the greatest importance attaches to the Chicago situation, because it means the expansion of rapid transit facilities on a large scale. Ever since the Chicago elevated lines were started at the time of the World's Columbian Exposition in 1893, there has been a need for expansion of the city's facilities for rapid passenger transportation between the central business district and the outlying residential sections. This has been met in the past by extensions to the elevated lines from time to time, followed by their consolidation into one system a few years ago. More recently there has been felt the necessity of providing more direct routes to the heart of the business district, and for reaching a greater number of outside localities than has been possible through the existing set-up. When the franchises of the Chicago Surface Lines expired in 1927, it was felt that the time had come for the consummation of a program for such a system of rapid transit and surface lines as would serve the entire city. Accordingly, plans were made for a consolidation of all facilities. The plan has been approved by the city and only awaits the working out of detail. This will provide a main subway system under State Street, and numerous extensions to the existing elevated lines. It will take several years to finish the construction work, so that it is not likely there will be any addition to the rapid transit mileage this year.

Data on Rapid Transit Lines in United States

	Route-Miles			Cars		
	Subway	Elevated	Total Track Miles	Passenger	Service and Other	Total
Chicago, Ill.						
Chicago Rapid Transit Co.	0.	81.1	202.4[1]	1,787	41	1,828
Boston, Mass.						
Boston Elevated Ry	12.2	10.0	57.5	528	...	....
Boston, Revere Beach & Lynn R.R.	0.0	13.8[1]	34.5[1]	93	16	109
New York, N.Y.						
New York Rapid Transit Corp.[2]	41.7	.....	280.6	2,087	52	2,139
Interborough Rapid Transit Co.	44.6	116.6	401.5	4,449	119	4,568
Hudson & Manhattan R.R.	8.5[3]	0.0	20.0	325	1	326
Staten Island Rapid Transit Co.	0.0	21.6[1]	44.7[1]	95	1	96
Cleveland, Ohio	Information not available.					
Philadelphia, Pa.						
Philadelphia Rapid Transit Co.:						
Market St.-Frankford Line	2.6	11.8	39.0	215	...	215
Broad St. Subway	6.1	0.0	27.1	150	3	153

[1] Operates a high-speed line on the surface on private right-of-way.
[2] Rapid transit lines of the Brooklyn-Manhattan Transit System.
[3] Also leases a high-speed surface line on the tracks of the Pennsylvania R.R. to Newark, N. J.

Another major expansion program is rapidly nearing completion in New York. The city has constructed a large amount of new subway lines, and these are being prepared for operation. There has been much uncertainty about the operation of these lines when completed. Plans have been made for independent operation by the city, in case negotiations for unification with one or both of the present operating companies, the Interborough Rapid Transit Company and the New York Rapid Transit Company, the latter a part of the Brooklyn-Manhattan Transit System, should be unsuccessful. At the present time a virtual agreement of policy has been reached between the two private companies, which has made itself evident by a more favorable attitude by these companies toward the unification plans advanced by the city. It is believed that a significant agreement has now been reached in the latest plan presented for unification of all rapid transit facilities in the city. This probably will mean that the city subway system will be operated as part of a main unified system. At any rate, it is likely that the city's lines will be placed in operation during the present year.

In connection with the improvements being made by the Pennsylvania Railroad at its new passenger terminal in Newark, N. J., it is planned to operate a rapid transit line in the bed of the abandoned Morris Canal which passes beneath the Pennsylvania Station site. When completed the Public Service Co-ordinated Transport plans to operate the line in conjunction with its extensive car and bus system, with lines radiating to many points in northern New Jersey.

Rapid transit became an actuality in Cleveland last year in connection with the new Cleveland Union Terminal project inaugurated by the Van Sweringen interests. The contract for the use of the Terminal provided station facilities for rapid transit service in the station proper as well as approaches east and west for about 2 miles. Certain of the existing steam railroad lines have been equipped with overhead wires for the operation of rapid transit trains. These will be run into the new terminal under the Public Square, and will give a high-speed service to outlying districts. The line to Shaker Heights has been operating into the terminal for several months, and its line paralleling the tracks of the Nickel Plate has been completed only recently. This rapid transit line is now an operating entity, known as the Cleveland Interurban Railroad. The investment in rapid transit facilities for Cleveland has reached a total of $20,000,000.

On the other systems there have been only minor changes since the article in this paper for January, 1930, was published. The Broad Street subway, built by the city of Philadelphia, and operated by the Philadelphia Rapid Transit Company, was put in service all the way from Erie Avenue to South Street. At present only two of the four tracks are being used regularly, but when the riding becomes sufficiently heavy, operation will be carried on the four tracks.

One of more than 500 taxicabs now operated by Public Service Co-ordinated Transport in conjunction with its street cars and buses

Taxicab Operation by Electric Railways Growing

By JOHN A. MILLER, Jr.
Editor *Electric Railway Journal*

Co-ordination of all street transportation facilities is progressing through joint operation of street car, bus and taxicab service. Number of taxis operated under electric railway auspices nearly doubled during the past year. Total is now more than 2,300. Need for regulation more widely recognized

CO-ORDINATION of taxicab service with other forms of street transportation made notable progress during the past year. The number of electric railways engaged in taxicab operation was substantially increased through the acquisition of control of local cab companies to supplement the existing street car and bus service in various cities. Of even greater significance, however, was the wider recognition afforded to the principle that the taxicab is, in reality, a common carrier and should be subject to the same kind of regulation and control as other common carriers. Legislation to accomplish this purpose was enacted on a state-wide basis in Rhode Island, and local ordinances of a similar nature were passed in a number of cities.

At the beginning of 1930, taxicab service was affiliated with electric railway service in a number of cities, including Philadelphia, Pa., Kansas City, Mo., Cincinnati, Ohio, Grand Rapids, Mich., Tacoma, Wash., and New Bedford, Mass. Additional railways entering this field during the past year include Public Service Co-ordinated Transport of New Jersey, the Trenton Transit Company and the United Electric Railways, of Providence, R. I. The Cincinnati Street Railway greatly extended the scope of its taxicab interests. As a consequence of these activities, the number of taxicabs operated under electric railway auspices was practically doubled. At present, twelve electric railways are engaged in taxicab operation with a total of 2,363 such vehicles.

Entry of Public Service Co-ordinated Transport into the field of taxicab operation was an outstanding event of the past year. Advantages of electric railway participation in the taxi business are set forth by M. R. Boylan, vice-president in charge of operation, as follows:

> **In a metropolitan territory such as that of Public Service, the operation of taxicab service in connection with, and under the same management as, street car and bus service is essential to efficient co-ordination of local transportation service. Under existing conditions and until the outstanding advantages to the public of unified management of transit facilities is generally recognized and reflected in laws, ordinances and the regulations of governing bodies, the operation of taxicabs is unlikely to result in more than a mere compensatory return. Nevertheless, it is justified as a measure of protection to the railway and bus arms of the service, which are seriously threatened by wildcat taxicab competition, and as laying the foundation of the future comprehensive service which it should be the aim of all progressive local transportation systems to provide.**

In Cincinnati the street railway acquired an interest in the taxi business a little more than a year ago. This step followed the passage of a city ordinance in 1929 by which the taxicab was definitely classified as a public utility and placed on a certificate of public convenience and necessity basis. During 1930 the railway interests were expanded until there are now some 245 cabs operated by its affiliated companies. Reasons for adopting this policy are explained by Walter Draper, president, as follows:

> **With the advent of low-priced automobiles operating as taxicabs, the distinct line between transportation provided by street cars and buses and that provided by taxicabs became a twilight zone. This is true especially where several are carried for the same price as one in the taxicab. I believed that the public transportation companies should ascertain whether there was a place for the small cab at a low rate, and, therefore, we became interested in an operation of this kind, having previously become interested in a company operating built-for-the-purpose cabs on regular metered rate. I felt that the public and the transportation system should be saved from irresponsible and cut-rate competition. We have demonstrated to our satisfaction that while, under certain conditions, a few individuals or even small groups might operate low-priced automobiles and pay expenses, it is impossible for dependable fleet service for the entire community to be given at cut rates. Our taxicab business in Cincinnati has not been a part of the street car and bus operation under the service-at-cost plan but has been undertaken separately and on its own responsibility. I have stated publicly, however, that in case the business becomes important enough materially to effect car riding or becomes a profit earner, our company will arrange for the car riding public to benefit thereby.**

NEED FOR REGULATION BECOMING MORE WIDELY RECOGNIZED

Regulation of the taxicab as a common carrier has been largely responsible for the increasing interest shown by electric railways in this form of transportation. In Arizona, Connecticut, Maryland, Oklahoma, Pennsylvania and Rhode Island, the regulation of taxicabs has been effected on a state-wide basis. In about a dozen cities in other states it has been effected by local ordinance. The entry of the United Electric Railways, of Providence, and the Cincinnati Street Railway into the taxicab business followed closely upon the adoption of regulatory measures in the territories served by those companies. On the other hand, Public Service Co-ordinated Transport, in New Jersey, and Kansas City Public Service Company decided to undertake taxicab operation without waiting for the stabilization which might be expected to result from the adoption of regulation.

Adequate regulation of taxicabs is an essential requirement before a street railway can undertake this kind of service with any reasonable hope of success, according to T. Julian McGill, vice-president Twin City Rapid Transit Company. About four years ago, this railway entered the taxicab field through the purchase of the Yellow Cab Company operating some 300 taxis in the Twin Cities and Duluth. Results failed to come up to expectations, however, and the taxi business was sold early in 1929. Commenting on this subject, Mr. McGill says:

> **Unless the street car company can get a taxicab monopoly, which does not seem legally possible, or can at least legally control the maximum number of cabs and the fares, it will find the cab business a losing venture.**

Without regulation, co-ordination of taxicab operation with other forms of street transportation is impossible, he thinks. Moreover, the street railway is likely to be brought into serious conflict with public authorities because of inherent peculiarities of the taxicab business. Danger exists, he says, that the good name of the railway will be besmirched by its association with taxi operation.

P.R.T. IS LARGEST RAILWAY OPERATOR OF TAXIS

The Philadelphia Rapid Transit Company is, at present, the largest electric railway operator of taxicabs, with 968 such vehicles. Passage of regulation placing the taxicabs under the control of the Pennsylvania Public Service Commission preceded the entry of the railway into this business. In April, 1926, after the approval of the city and the commission had been secured, P.R.T. purchased the Yellow Cab Company of Philadelphia. This company was the largest in the city and the third largest in the world, having a total of 1,100 vehicles. Subsequently, the Cunningham, Diamond and Quaker Cab Companies were taken over. As part of its plan for improving the service, P.R.T. in 1929 purchased 500 new taxicabs built in accordance with its own designs. Dur-

Taxicab Operation by Electric Railways

Name of Railway and Taxicab Subsidiary	Number of Cabs
Philadelphia Rapid Transit Company, Philadelphia, Pa. *Yellow Cab Company*	968
Public Service Co-Ordinated Transport, Newark, N. J. *Yellow Cab Company, Brown & White Taxicab Company*	517
United Electric Railways, Providence, R. I. *Yellow Cab Company, Monahan Taxi Company*	250
Cincinnati Street Railway, Cincinnati, Ohio *Taxicabs of Cincinnati, Inc.*	245
Kansas City Public Service Company, Kansas City, Mo. *Yellow Cab Company*	237
Grand Rapids Railroad, Grand Rapids, Mich. *Yellow Cab Company, Checker Cab Company*	69
Metropolitan Coach Company, Chicago, Ill. *Lake Shore Yellow Cab and Transfer Company*	42
Tacoma Railway & Power Company, Tacoma, Wash. *Yellow Cab Company, Checker Cab Company*	17
Union Street Railway, New Bedford, Mass. *Saf-T-Cab Company*	10
Trenton Transit Company *Yellow Cab Company*	5
Potomac Edison Company, Frederick, Md. *Blue Ridge Transportation Company*	2
Chicago & Joliet Electric Railway, Joliet, Ill.	1
Total	2,363

ing the past year, some reduction has been made in the number of cabs operated.

Second only in point of size to the taxi operation of P.R.T. is that of Public Service Co-ordinated Transport, of New Jersey, with 449 vehicles. This railway entered the taxi field early in 1930 by the purchase of the Yellow Cab and the Brown & White Taxicab Companies of Newark. The Yellow company already had a well-organized and extensive service covering that city and numerous adjacent communities. Through an arrangement with the railway company, it maintained an elaborate system of telephone call boxes located on the span wire poles.

Entrance of the United Electric Railways, of Providence, into the taxi field followed closely upon the passage of a law by the Rhode Island Legislature, effective July 1, 1930, placing taxicabs under state regulation. Under this law the Public Utilities Commission is authorized to prescribe adequate service for reasonable maximum rates and to establish rules and regulations concerning fares, service, operation and equipment. Soon after the passage of this regulation, the Rhode Island Public Service Company, the parent company of the United Electric Railways, purchased several of the local taxi companies.

Kansas City Public Service Company is another newcomer in the field of taxi operation by electric railways, although its original entrance in the business actually occurred during the latter part of 1929. Commenting on the situation, F. G. Buffe, vice-president in charge of operations, says:

> **We had an opportunity to buy the Yellow Company of Kansas City, which was an old-established and well-liked concern, doing practically all of the high-class taxicab business in the town. We felt that it would fit in with our street car and bus operation and that any economies in the taxicab operation could be worked out through a consolidation. Furthermore, it served to round out a well-balanced public transportation system and gave us a measure of protection against the hazard of cut-rate taxi outfits from which many companies have suffered.**

In Grand Rapids the City Commission in 1929 authorized the street railway to include taxicabs under its operations. This arrangement has now been in effect for somewhat more than a year, and experience has shown that the public is better satisfied to have the taxi service operated by the established transportation company than by the individuals previously operating.

Although the activities of the electric railway in the field of taxicab operation were considerably expanded during 1930, the part they are playing is as yet a comparatively minor one. According to the latest available figures there are approximately 65,000 taxicabs in operation in the 189 cities of over 50,000 population in the United States. Those operated under electric railway auspices represent less than 4 per cent of the total. Even in the cities where the railways are most active in taxicab operation they are subject to considerable competition. In Philadelphia there are several hundred cabs under independent auspices, in addition to those under the control of the Philadelphia Rapid Transit Company. In Kansas City and Cincinnati the electric railways operate a majority of the cabs but not by any means all of them. In general, the same situation exists in the New Jersey communities served by Public Service Co-ordinated Transport. Only in Grand Rapids and Providence are the railways comparatively free of competition in taxicab operation.

EXTENSION OF OPERATION DEPENDS ON REGULATION

Extension of taxicab operation by electric railways appears to depend largely on the provision of adequate regulation. As has already been noted, such regulation is now in effect in six states and about twelve cities in other states. Its adoption in New York was recently recommended by a commission appointed by the Mayor to study the situation. Directly affecting about 20,000 cabs, a substantial proportion of the total number in the United States, these recommendations will undoubtedly have a far-reaching influence if adopted.

The desirability of regulation is becoming better recognized as time goes on. In a recent issue of the *Saturday Evening Post,* the leading editorial discussed the subject of co-ordination of transportation facilities, particularly the evils resulting from cut-rate or low-rate taxicabs. Appealing for regulated co-ordination, this editorial said: "Just as the street railway deserves a living wage, so does the taxicab. Just as one is a proper subject for strict regulation by a utility commission, so is the other. It is difficult to see how conditions can be anything but chaotic unless the number of taxicabs is regulated and unless reasonable fares both maximum and minimum are provided by a public utility."

Similar in tenor is the recent recommendation of the public utilities committee of the American Society for Municipal Improvements, which urges "that city officials should take the initiative in having their city transit systems operate preferably under a service-at-cost franchise, not only the rail system, but also the buses and taxicabs, thus producing a transit system which, under public regulation, will meet the growth of the city with adequate rail, bus and taxicab service at the least possible cost to the public."

The process of changing the taxicab business into a public utility is likely to be slow. It is indisputable, however, that the adoption of adequate regulation will be a long step toward placing the taxicab on a sound economic basis and will, at the same time, assure an improved quality of service.

Financial Requirements Met Without Difficulty

By
MORRIS BUCK
Engineering Editor
Electric Railway Journal

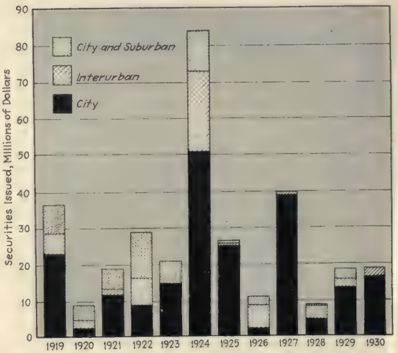
Despite general business depression, the electric railways found little trouble in taking care of maturing obligations and refinancing. Several receiverships terminated, but others were begun

CONTINUING the good record made in 1929, the electric railway industry came through the past year in excellent shape, in so far as its finances are concerned. While there were some difficult situations to be met, they were, with few exceptions, taken care of satisfactorily. Furthermore, the way was cleared to make possible the solution of a number of problems that have confronted the industry for several years. Chief among them is that of the Chicago Surface Lines, the status of which has been unsatisfactory ever since the termination of their franchises in January, 1927. This subject is considered in greater detail elsewhere in this article.

Major pieces of financing last year in which the electric railways of the country participated amounted to $18,877,000. This is slightly larger than the total amount reported for 1929. The yields of the several issues put out, as shown in Table V, ranged between 4 per cent and 7 per cent. The latter rate, however, attaches only to $2,500,000 of short term notes of the Chicago, North Shore & Milwaukee Railroad due for retirement Jan. 1, 1931.

The largest individual issue during the past year was that of the Cincinnati Street Railway Series B 6 per cent gold bonds, due to mature April 1, 1955. These were put out at 99½, to yield 6.04 per cent. Of equal importance were two issues of Montreal Tramways Series D general and refunding sinking fund gold bonds, one lot of $3,000,000 being put out in January at 96½, to yield 5.25 per cent, and the other of $2,000,000 being issued in September at 91½, to yield 5.63 per cent.

As a means of financing the purchase of electric railway cars, the Electric Railway Equipment Securities Corporation which was formed by the co-operation of the General Electric Company, the Westinghouse Electric & Manufacturing Company and the J. G. Brill Company some time ago, came forward with an issue to permit any railways wishing to do so to purchase cars under the equipment trust plan. In November a total of $2,177,000 of 4½ per cent equipment trust certificates were offered by the bankers representing this group, at rates yielding from 4 to 5.25 per cent. These notes are to be retired serially each six months. They cover liens against 163 cars distributed among seven properties, and represent less than 75 per cent of their cost, the remainder having been paid in cash.



Securities issued by electric railway companies during the past twelve years have varied widely in type and amount

Maturities of electric railway securities in 1930 amounted to $49,274,000. A large portion of them, or $16,179,000 were retired, while $4,504,000 were refunded and $7,813,000 were extended. Defaults of principal amounted to $6,843,000. The largest items in this list are the Duluth Street Railway and the underlying properties of the New York State Railways.

No disposition has been made of the matured securities of the Worcester Consolidated Street Railway. The New York, New Haven & Hartford Railroad, which in the past advanced the money for rehabilitation, announced that it would not continue to do so. Up to the end of the year the company had been trying to formulate a plan acceptable to the bondholders, but without success. As a result a receiver was appointed on Dec. 31.

The Louisville Railway, with an issue of $6,000,000 first mortgage bonds maturing, met the situation through

Table I—Twelve-Year Record of New Electric Railway Financing Involving Bond or Note Issues of More Than $400,000

	City Railway	Interurban	City and Surburban
1919	$22,800,000	$6,050,000	$7,550,000
1920	2,250,000	2,340,000	4,200,000
1921	11,740,000	1,900,000	7,250,000
1922	865,000	750,000	27,138,000
1923	14,562,000	....	6,305,000
1924	50,797,000	21,731,600	11,414,000
1925	23,141,000	750,000	486,000
1926	2,100,000	6,500,000	2,500,000
1927	38,956,000	720,000	0
1928	4,400,000	4,000,000	400,000
1929	13,500,000	2,310,000	2,500,000
1930	16,377,000	2,500,000	....

Table II—Comparison of Maturities in the Electric Railway Field

1931	$51,897,200	1925	$28,224,000
1930	49,274,000	1924	73,051,600
1929	27,316,600	1923	94,851,800
1928	47,577,200	1922	160,015,860
1927	180,798,000	1921	207,617,530
1926	26,644,790	1920	80,466,100

the sale of its power plants to the Louisville Gas & Electric Company for $3,000,000, and the issue of new bonds totaling $3,000,000. This made it possible to pay off half the matured bonds to holders who would not agree to an extension, and issue the new ones in exchange for the remainder.

The disposition of the various maturities is indicated in Table III.

For the present year the maturities amount to $51,897,200. The detail is given in Table IV. Outstanding items are the securities of the West Penn system and its subsidiaries in January, and of the Detroit United Railway in December. It is understood that the city of Detroit, which took over the city lines of the Detroit United Railway in 1922, will furnish the money for the retirement of this latter issue when it falls due.

Leading electric railway bonds that are in default are

Table IV—Principal Electric Railway Maturities in 1931

(Based on Dow, Jones & Company Compilation)

Company	Security and Rate	Amount
January		**$11,772,500**
Pittsburgh, McKeesport & Connellsville Ry	Cons. 5	2,894,000
West Penn Rys	First 5	2,780,500
Chicago, North Shore & Milwaukee R.R	1-yr. 6	2,500,000
Wheeling Traction Co	Cons. 5	2,500,000
Dayton Traction Co	First 6	250,000
Hamilton City Lines	First 6	200,000
Toledo & Indiana Traction Co	First 5	273,000
Brooklyn City R.R	Eq.Tr. A 5	375,000
February		**5,665,500**
Buffalo Ry	Cons. 6	4,082,000
Vermont Co	First 5	846,000
Fitchburg & Leominster St. Ry	First 5	300,000
Philadelphia Rapid Transit Co	Eq. Tr. G 5½	237,500
Pittsburgh Rys	Eq. Tr. 6	200,000
March		**5,725,000**
Cleveland Ry	First 5	4,891,000
Jacksonville Traction Co	Cons. 5	834,000
April		**7,217,700**
Atlantic Avenue R.R. (Brooklyn)	Cons. 5	2,224,000
Milwaukee Northern Ry	First 5	1,737,000
Wilkes-Barre & Wyoming Valley Traction Co	First 7	1,500,000
Inter-Urban Ry., Des Moines	First 7½	633,500
Inter-Urban Ry., Des Moines	U. S. 6	633,500
Wheeling & Elm Grove Ry	Sec'd 5	484,700
June		**2,244,000**
Paterson (N. J.) Ry	Cons. 6	1,132,000
Wilkinsburg & Verona (Pa.) St. Ry	First 5	612,000
Detroit United Ry	Deb. 6	500,000
July		**3,570,000**
Pitcairn & Wilmerding (Pa.) St. Ry	First 5	1,880,000
Seattle & Rainier Valley Ry	First 6	484,000
Oley Valley Ry	First 4½	250,000
United Traction-Oley Valley Ry	Ctf. 5	240,000
Trappe & Limerick Elec. St. Ry	First 4½	250,000
Trappe & Limerick Elec. St. Ry	Ctf. 5	233,000
Pittsburgh, McKeesport & Greensburg Ry	First 5	233,000
August		**237,500**
Philadelphia Rapid Transit Co	Eq. Tr. G. 5½	237,500
September		**1,489,000**
Southwest Missouri R.R	G. & Rf. 5	1,024,000
Birmingham, Knoxville & Allentown (Pa.) Traction Co	First 6	465,000
October		**3,541,000**
Maryland Electric Rys. (Baltimore)	First 5	2,465,000
Trenton Passenger Ry	First 6	650,000
New York & Stamford Ry	First 5	426,000
December		**10,350,000**
Johnstown Passenger Ry	Refdg 4	1,601,000
Johnstown Passenger Ry	Cons. 4	399,000
Detroit United Ry	Cons. 4½	7,580,000
Detroit United Ry	Deb. 4½	500,000
Philadelphia Rapid Transit Co	Eq. Tr. H 5½	270,000
Total for 1931		**$51,807,200**

Table III—Disposition of Electric Railway Maturities in 1930

Company	Issue and Rate	Amount	Disposition
January		**$2,079,000**	
Syracuse Rapid Transit Co	2nd 5	$654,000	Defaulted
Topeka Ry	Ist 5	622,000	Retired
Albany Ry	Cons. 5	428,000	Defaulted
Brooklyn City R.R	Eq. Tr. A 5	375,000	Retired
February		**$3,937,500**	
Chicago, North Shore & Milwaukee R.R	3-yr. 5½	$2,500,000	Refunded
Hammond, Whiting & East Chicago Ry	Ist 5	1,000,000	No data
Philadelphia Rapid Transit Co	Eq. Tr. G 5	237,500	Retired
Pittsburgh Rys	Eq. Tr. 6	200,000	Retired
March		**$2,900,000**	
United Rys. & Electric Co. of Baltimore	3-yr. 6	$2,500,000	Retired
Berkshire St. Ry	Deb. 5	200,000	Extended
Empire Passenger Ry	Ist 3½	200,000	Extended
April		**$2,179,000**	
Rochester Ry	Cons. 5	$2,179,000	Defaulted
May		**$3,332,000**	
Duluth St. Ry	Ist 5	$2,500,000	Defaulted
Duluth St. Ry	General 5	832,000	Defaulted
June		**$2,770,000**	
City & Suburban Ry	Ist 4	$1,290,000	Retired
Detroit United Ry	Serial 6	500,000	Retired
Doylestown & Willow Grove Ry	Ist 4	500,000	Extended
Pasadena & Mount Lowe Ry	Ist 4	480,000	Retired
July		**$15,641,000**	
Louisville Ry	Cons. 5	$6,000,000	Extended
Newark Passenger Ry	Cons. 5	5,849,000	Retired
West End St. Ry	Deb. 4½	1,604,000	Refunded
Duquesne Traction Co	Ist 5	1,313,000	Extended
West Liberty St. Ry	Ist 5	400,000	Retired
Allentown & Kutztown Traction Co	Ist 5	250,000	Defaulted
Atlanta St. R.R	Ist 6	225,000	Retired
August		**$5,542,500**	
Worcester Consolidated St. Ry	Ref'g 6½	$2,116,000	Extension of securities under negotiation
Worcester Consolidated St. Ry	Ref'g 4½	1,489,000	
Worcester Consolidated St. Ry	Deb. 6	1,200,000	
Worcester & Southbridge St. Ry	Ist 6	500,000	
Philadelphia Rapid Transit Co	Eq. Tr. G 5½	237,500	Retired
September		**$2,493,000**	
Hartford St. Ry	Ist 4	$2,493,000	Retired
October		**$1,346,000**	
Pittsburgh, Allegheny & Manchester Traction Co	5	$1,346,000	No disposition
November		**$6,284,000**	
Portland (Ore.) Ry	Pref. 5	$5,870,000	No data
Sioux Falls Traction Co	Ist 6	414,000	No data
December		**$770,000**	
Detroit United Ry	Serial 6	500,000	Retired
Philadelphia Rapid Transit Co	Eq. Tr. H 5½	270,000	Retired

Summary of Dispositions by Months

Month	Retired	Refunded	Extended	Defaulted	No Disposition	Unknown
Jan	$997,000	....	....	$1,082,000	....	....
Feb	437,500	$2,500,000	....	....	....	1,000,000
March	2,500,000	400,000	....	....	....	....
April	....	....	....	2,179,000	....	....
May	....	....	....	3,332,000	....	....
June	2,270,000	....	500,000	....	....	....
July	6,474,000	1,604,000	7,313,000	250,000	....	....
Aug	237,500	....	....	....	5,305,000	....
Sept	2,493,000	....	....	....	....	....
Oct	....	....	....	....	1,346,000	....
Nov	....	....	....	....	....	6,284,000
Dec	770,000	....	....	....	....	....
	$16,179,000	$4,504,000	$7,813,000	$6,843,000	$6,651,000	$7,284,000

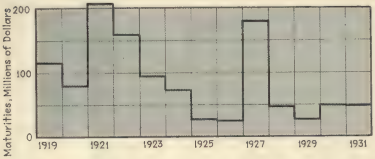
Grand total **$49,274,000**

Table V—Major Electric Railway Issues in 1930

Issue	Price	Maturity	Yield	Amount
Montreal Tramways—General and refunding 5, Series D	96½	1955	5.25	$2,000,000
Boston Elevated Ry.—Ten-year 5	99½	1940	5.06	1,200,000
Cincinnati St. Ry.—First 6, Series B	99½	1955	6.04	5,000,000
Chicago, North Shore & Milwaukee R.R. 6 per cent notes	99.12	1931	7.00	2,500,000
Montreal Tramways—General and refunding 5, Series D	91½	1955	5.63	3,000,000
Electric Ry. Equipment Securities Corp.[1] Equipment trust gold certificates	.....	Serial 10 yr.	4–5.25	2,177,000
Louisville Ry.[2]—First consolidated extended 6½	100	1935	6.5	3,000,000
Total				$18,877,000

[1] Covers 163 cars distributed among seven properties.
[2] Sold only to satisfy holders who did not agree to extension.

shown in Table VI. The compilation has been recast this year to include defaults of principal as distinguished from defaults of interest. It will be noted that two principal groups of securities are in default of principal only, and interest is being paid regularly or is being impounded. These are the Chicago Surface Lines underlying companies and the Pittsburgh Railways group. In Chicago retirement or refunding of the matured bonds awaits only the consummation of the consolidation plan mentioned at the beginning of this article. Interest on the first mortgage bonds is being paid regularly. On the junior mortgages interest is being accumulated, but, by order of the court, it is being held on deposit pending the final settlement.



Maturities of electric railway securities this year are almost the same in total as those of 1930

The underlying companies which were absorbed by the Pittsburgh Railways some 30 years ago issued a large number of securities which are falling due in considerable amounts at the present time. No definite plan for

Table VII—Electric Railway Receiverships—1930

	Miles of Single Track Involved	Capital Stock	Funded Debt	Receiver's Certificates
Key System Transit Co., Oakland, Cal.	246.60	$11,181,800	$18,261,000	None
Calumet & South Chicago Ry., Chicago, Ill.	128.32	10,000,000	5,532,000	None
Chicago City & Connecting Rys., Chicago, Ill.	(b)	(a)	20,616,000	None
Chicago City Ry., Chicago, Ill.	339.23	18,000,000	33,926,000	None
Southern St. Ry., Chicago, Ill.	(b)	2,400,000	....	None
Indianapolis St. Ry., Indianapolis, Ind.	168.33	7,500,000	13,136,110	None
Terre Haute, Indianapolis & Eastern Traction Co., Indianapolis, Ind.	164.53	22,550,000	8,661,000	$50,000
Massachusetts Northeastern St. Ry., Haverhill, Mass.	66.00	2,165,000	1,072,000	None
Worcester Consolidated St. Ry., Worcester, Mass.	(c)	(c)	(c)	(c)
Kansas City, Clay County & St. Joseph Ry., Kansas City, Mo.	74.06	4,000,000	2,676,000	None
Auburn & Syracuse Elec. R.R., Syracuse, N. Y.	63.61	1,962,000	1,752,000	None
Schenectady Ry., Schenectady, N. Y.	116.66	4,100,000	2,676,000	None
Toledo, Fostoria & Findlay Ry., Fostoria, Ohio	64.00	1,500,000	64,000	8,500
Total for 1930	1,431.34	$85,358,800	$108,372,110	$58,500

(a) 250,000 shares. No par value.
(b) Included in other Chicago companies.
(c) Information not available.

Table VI—Leading Electric Railway Bonds in Default of Principal or Interest

	Issue and Rate	Principal Amount	Principal Defaulted	Interest Defaulted
Bethlehem & Nazareth Passenger Ry.	First 5	$150,000	May, 1929	May, 1929
Broadway & Seventh Ave. R.R.	Cons. 5	5,053,000	....	June, 1930
Buffalo & Erie Ry.	First 6½	994,000	....	July, 1928
Buffalo & Lackawanna Traction Co.	5	1,160,000	Dec., 1928	Dec., 1918
Chatham, Wallaceburg & Lake Erie Ry.	6	800,000	July, 1925	July, 1925
Chicago Surface Lines underlying companies:				
Calumet & So. Chicago Ry.	5	4,978,800	Feb., 1927	....
Chicago City & Conn. Rys.	5	20,616,000	Jan., 1927	....
Chicago City Ry.	First 5	30,533,400	Feb., 1927	....
Chicago Rys.	First 5	50,089,000	Feb., 1927	....
	Cons. A5	15,696,600	Feb., 1927	Note
	Cons. B5	16,934,400	Feb., 1927	Note
	Pur M. 5	3,969,160	Feb., 1927	Note
	Adj.Inc.4	2,379,130	Feb., 1927	Note
Clinton (Iowa) St. Ry.	First 5	400,000	Apr., 1926	Apr., 1926
Duluth St. Ry.	First 5	2,500,000	May, 1930	May, 1930
	Genl. 5	807,000	May, 1930	May, 1930
Evansville & Ohio Valley Ry.	5	1,031,700	....	Jan., 1928
Ft. Dodge, Des Moines & Southern Ry.	First 5	5,250,000	....	Dec., 1929
	Deb. 7	315,000	....	Dec., 1929
Hamburg Ry. (Buffalo, N. Y.)	First 4	750,000	Nov., 1926	May, 1920
Indianapolis St. Ry.	Genl. 4	4,190,000	....	July, 1930
Broad Ripple Traction Co.	First 5	285,000	....	July, 1930
Citizens St. R.R.	First 5	4,000,000	....	May, 1930
Indianapolis Traction & Terminal Co.	First 5	3,314,000	....	Apr., 1930
Inter-Urban Ry. (Des Moines, Iowa)	First 7½	633,500	....	Apr., 1927
	Deb. 6	350,000	Jan., 1923	Jan., 1923
Jacksonville Traction Co.	Notes 5	1,242,600	....	Mar., 1930
Kansas-Oklahoma Trac. Co.	6	234,000	....	Nov., 1924
Kansas City, Clay Co. & St. Joseph Ry.	5	2,676,000	....	Sept., 1930
Lebanon Valley St. Ry.	First 5	405,700	July, 1929	Jan., 1930
Massachusetts Northeastern St. Ry.	5	849,000	....	Jan., 1930
Citizens Elec. St. Ry.	First 6	223,000	....	Dec., 1929
New York & Queens Co. Ry.	First Con. 4	1,300,000	July, 1922	Apr., 1922
Steinway Ry.	6	1,500,000	July, 1922	July, 1922
New York State Rys.	Con. A4½	13,457,000	....	Nov., 1929
	Con. B6½	3,000,000	....	Nov., 1929
Utica & Mohawk Valley Ry.	First 4½	2,258,000	....	Mar., 1930
Utica Belt Line St. Ry.	First 5	500,000	....	Nov., 1929
Rochester Ry.	First 5	2,130,000	Apr., 1930	Apr., 1930
	Sec'd 5	1,500,000	....	Dec., 1929
Syracuse Rapid Transit Ry.	First 5	2,500,000	....	Mar. 1930
	Sec'd 5	654,000	Jan., 1930	Jan. 1930
Ogdensburg St. Ry.	6	150,000	Sept., 1925	Sept. 1925
Pittsburgh Rys. underlying cos.				
Bloomfield St. Ry.	First 5	250,000	Aug., 1923	....
Brownsville Ave. St. Ry.	First 5	300,000	Aug., 1926	....
Central Passenger Ry.	First 6	125,000	Oct., 1924	....
Central Traction Co.	First 5	325,000	July, 1929	....
Citizens Traction Co.	First 5	246,000	Oct., 1927	....
Duquesne Traction Co.	First 5	1,313,000	July, 1930	....
Millvale, Etna & Sharpsburg St. Ry.	First 5	741,000	Nov., 1923	....
Penn St. Ry.	First 5	250,000	Dec., 1922	....
Pittsburgh, Allegheny & Manchester Traction Co.	First 5	1,346,000	Oct., 1930	....
Pittsburgh, Crafton & Mansfield St. Ry.	First 5	164,000	July, 1924	....
Pittsburgh Incline Plane Co.	First 6	150,000	July, 1919	....
Pittsburgh Traction Co.	First 5	666,000	Oct., 1927	....
Pittsburgh & West End Passenger Ry.	First 5	303,000	July, 1922	....
Washington Elec. St. Ry.	First 5	125,000	Feb., 1927	....
West Liberty St. Ry.	First 5	400,000	July, 1930	....
Rochester & Syracuse R.R.	First 5	2,448,500	....	May, 1927
Auburn & No. Elec. R.R.	First 5	236,000	....	May, 1927
Syracuse, Lake Shore & Northern Elec. Ry.	First 5	2,496,000	....	May, 1927
Salt Lake & Utah R.R.	First 6	1,431,900	....	Oct., 1925
	Conv. 7	150,000	Oct., 1928	Oct., 1925
Schenectady Ry.	First A5	2,676,000	....	Sept., 1930
Seattle & Rainier Valley Ry.	First 6	484,000	....	Jan., 1928
	Genl. 5	577,500	....	Jan., 1928
Southwest Missouri R.R.	Gen. & ref. 5	1,034,000	....	Sept., 1926
Southwest Miss. Elec. Ry.	Ref. 6	909,000	Sept., 1928	Sept., 1926
Webb City No. Elec. R.R.	First 6	125,000	Sept., 1928	Sept., 1926
Springfield (Ohio) Ry.	First 5	1,335,400	....	Mar., 1928
Tacoma Ry. & Pwr. Co.	5	1,236,000	Apr., 1928	Apr., 1928
Terre Haute, Indianapolis & Eastern Traction Co.	First 5	4,816,000	....	Apr., 1930
Indianapolis, Crawfordville & Danville Elec. Ry.	First 5	625,000	....	May, 1930
Indianapolis & Martinsville Rapid Transit Co.	First 5	750,000	....	July, 1930
Indianapolis & Northwestern Traction Co.	First 5	2,470,000	....	Sept., 1930
Union Traction Co. (Coffeyville, Kans.)	5	914,000	....	Jan., 1925
United Traction Co. (Albany)	Cons. 4½	3,575,000	....	Dec., 1929
Albany Ry.	Cons. 5	428,000	Jan., 1930	Jan., 1930
	Genl. 5	496,000	....	Dec., 1929
Waterloo, Cedar Falls & Northern R.R.	4½	5,773,000	....	Jan., 1922
Worcester Consolidated St. Ry.	Ref. 6½	1,475,000	Aug., 1930	Aug., 1930
	Ref.	1,930,000	Aug., 1930	Aug., 1930
Youngstown & Ohio River Ry.	First 5	1,200,000	....	Apr., 1927

Note: Interest on these issues is being accumulated, but is being held by order of the court pending the final settlement of the receiverships.

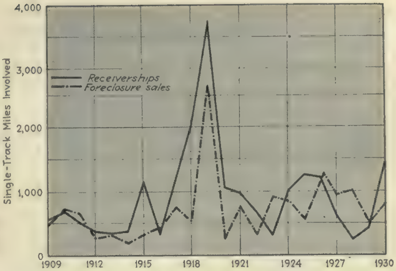
Table VIII—Record of Electric RailwayReceiverships

Year	Number of Companies	Miles of Single Track Involved	Outstanding Securities Stocks	Outstanding Securities Bonds
1909	22	558.00	$29,962,200	$22,325,000
1910	11	696.61	12,629,400	75,490,735
1911	19	518.90	29,533,450	38,973,293
1912	26	373.58	20,410,700	11,133,800
1913	18	342 84	31,006,900	47,272,200
1914	10	362.39	35,562,550	19,050,460
1915	27	1,152.10	40,298,050	39,372,375
1916	15	359.26	14,476,600	10,849,200
1917	21	1,177.32	33,918,725	33,778,400
1918	29	2,017.61	92,130,388	163,257,102
1919	48	3,781.12	321,259,354	312,915,104
1920	19	1,065.31	28,758,455	72,283,575
1921	19	986.42	32,909,525	36,177,800
1922	14	695.43	18,140,150	20,304,400
1923	12	333.63	8,332,100	14,707,066
1924	12	1,021.88	28,489,700	35,716,000
1925	14	1,260.07	51,383,195	54,696,525
1926	16	1,228.28	17,769,435	117,560,073
1927	13	624.32	17,615,050	20,875,450
1928	8	261.95	9,216,700	14,790,700
1929	5	425.50	39,035,000	35,138,400
1930	12	1,431.34	85,358,800	108,372,110

Table IX—Record of Electric Railway Foreclosure Sales

Year	Number of Companies	Miles of Track Involved	Outstanding Securities Stocks	Outstanding Securities Bonds	Outstanding Securities Receivers' Certificates
1909	21	488 00	$22,265,700	$21,174,000	(a)
1910	22	724 36	19,106,613	26,374,075	(a)
1911	25	660.72	91,354,800	115,092,750	(a)
1912	18	267.18	14,197,300	10,685,250	(a)
1913	17	302 28	15,243,700	19,094,500	(a)
1914	11	181 26	26,239,700	44,094,241	(a)
1915	19	308 31	30,508,817	16,759,997	(a)
1916	19	430 14	13,895,400	22,702,300	(a)
1917	26	745.19	27,281,900	27,313,045	(a)
1918	23	524 22	37,740,325	20,149,384	(a)
1919	29	2,675 48	89,893,400	79,836,738	$42,300
1920	13	259 90	7,782,400	11,227,328	52,000
1921	13	777.97	33,642,255	30,863,526	5,000
1922	13	322 88	7,491,500	12,640,600	14,683
1923	15	927.45	118,077,959	110,638,250	12,265,000
1924	14	869 25	21,022,800	34,845,535	3,440,388
1925	13	569.39	18,074,300	18,329,555	53,000
1926	28	1,291 17	20,054,700	57,340,363	214,000
1927	16	940 68	53,345,000	78,445,100	3,140,000
1928	8	1,003.73	26,084,325	40,683,400	168,150
1929	10	510.38	18,472,995	21,173,700	285,359
1930	8	1,054.88	36,254,965	44,564,000	....

(a) Data not available.



The marked improvement in the receivership situation in recent years is indicated by the reduction in track mileage involved since 1919

refunding these bonds has been announced, and, in the meantime, their owners have agreed to receive the interest pending the formulation of a plan. Interest is being paid regularly on such of these issues as are past due, and the same procedure is being followed on the others as they mature. The total of the Chicago bonds is $145,196,490, and of the Pittsburgh bonds $6,698,000. This latter figure does not include several small issues with less than $100,000 each outstanding.

Of the defaults of interest, the New York State Railways involves the greatest principal amount, $26,000,000, covering properties in Rochester, Syracuse, Utica, and a number of smaller cities. The Schenectady and Albany properties, while not parts of the New York State Railways, are in a similar situation and were controlled by the same interests.

Another large group of bonds in default are those of the Terre Haute, Indianapolis & Eastern Traction Company's system, including the Indianapolis Street Railway. These defaults involve $20,450,000 of principal. Plans for satisfying the holders were made, but were not approved by the state public utility commission. Up to the present time no substitute plan has been announced.

Apart from the systems just mentioned, no large defaults of principal or interest are to be noted. The total amount shown in the table, $258,053,790, while large in comparison with the figure for a year ago, $223,672,275, is not wholly comparable with it. This year during the search made for defaults several additional issues in default for a number of years were uncovered and included. It is, of course, difficult to locate these unless public demand is made for payment. Then, too, the receiverships of the South Side Lines in Chicago, which began in 1930 as a preliminary to the consolidation, add more than $56,000,000 to the total. This is explained in greater detail elsewhere. Apart from this one item the total of bonds in default would be materially less than it was a year ago.

Table X—Receiverships Terminated and Foreclosure Sales During 1930

Receivers Discharged with or without Foreclosure Sales or Following Abandonment	Miles of Single Track Involved	Capital Stock	Funded Debt	Receiver's Certificates	
ey System Transit Co., Oakland, Cal.	246.60	$11,181,800	$18,261,000	None	Sold in 1930. Reorganized as East Bay St. Ry., Ltd., East Bay Motor Coach Lines, Ltd., Key System Ltd., and Key Terminal Ry., Ltd.
hicago, South Bend & Northern Indiana Ry., South Bend, Ind.	125.00	$7,500,000	$4,955,500	None	Sold in 1930. Reorganized as Northern Indiana Ry.
uthern Michigan Rys., South Bend, Ind.	36.50	2,000,000	1,145,000	None	Sold in 1930. Reorganized as Northern Indiana Ry.
nion Traction Co. of Indiana, Anderson, Ind.	451.67	11,500,000	15,848,000	None	Sold in 1930.
es Moines City Ry., Des Moines, Iowa	103.39	1,000,000	2,444,000	None	Sold in 1929.
etroit & Port Huron Shore Line Ry., Detroit, Mich.	125.00	2,000,000	2,500,000	None	Sold in 1930. Track scrapped
ichigan R.R., Jackson, Mich.	156.71	4,000,000	4,050,000	None	Sold in 1928.
inneapolis, Anoka & Cuyuna Range Ry., Minneapolis, Minn.	29.25	300,000	284,000	None	Receivership lifted. Reorganized as Minneapolis, Anoka & Cuyuna Range R.R.
. Paul Southern Elec. Ry., Hastings, Minn.	17.54	658,225	364,900	$12,900	Sold in 1928.
annibal Ry. & Elec. Co., Hannibal, Mo.	6.50	111,165	102,500	None	Sold in 1930.
uburn & Syracuse Elec. R.R., Syracuse, N. Y.	63.61	1,962,000	1,752,000	None	Sold in 1930 and scrapped.
haca Traction Corp., Ithaca, N. Y.	12.72	400,000	763,000	25,000	Sold in 1929. Now operated by Ithaca Ry.
econd Avenue R.R., New York, N. Y.	23.96	(a)	None	None	Receivership lifted. Reorganized as Second Ave. R.R. Corp.
aten Island Midland Ry., Richmond, N. Y.	28.68	1,000,000	1,000,000	3,000	Abandoned.
huylkill Ry., Girardville, Pa.	34.00	400,000	1,550,000	None	Receivership lifted. Reorganized as Schuylkill Transp. Co.
uget Sound Elec. Ry., Tacoma, Wash.	57.10	3,116,200	7,322,000	None	Discontinued operation.
Total receiverships terminated (fifteen companies)	1,518.23	$47,129,390	$62,341,900	$40,900	

(a) 31,400 shares. No par value.

Table XI—Electric Railway Receiverships as of Dec. 31, 1930

	Year of Receivership	Miles of Single Track	Capital Stock	Funded Debt	Receiver's Certificates
Illinois					
Calumet & South Chicago Ry., Chicago	1930	128.32	$10,000,000	$5,532,000	None
Chicago City & Connecting Rys., Chicago	1930	(c)	(a)	20,616,000	None
Chicago City Ry., Chicago	1930	339.23	18,000,000	33,926,000	None
Chicago Rys., Chicago	1926	597.88	100,000	86,286,046	None
Peoria Ry. Terminal Co., Peoria (1)	1922	25.28	1,000,000	2,444,000	None
Southern St. Ry., Chicago	1930	(c)	2,400,000	....	None
Indiana					
Evansville & Ohio Valley Ry., Evansville	1927	42.85	511,985	1,960,900	None
Hammond, Whiting & East Chicago Ry., Hammond (2)	1929	34.16	1,000,000	1,788,000	None
Indianapolis St. Ry., Indianapolis	1930	168.33	7,500,000	13,136,110	None
Terre Haute, Indianapolis & Eastern Traction Co., Indianapolis (3)	1930	164.53	22,550,000	8,661,000	$50,000
Iowa					
Mississippi Valley Elec. Co., Iowa City	1926	6.00	538,420	148,000	None
Kansas					
Union Traction Co., Coffeyville	1927	87.00	700,000	1,150,000	None
Kentucky					
Owensboro City R.R., Owensboro	1923	11.95	75,000	400,000	None
Massachusetts					
Massachusetts Northeastern St. Ry., Haverhill	1930	66.00	2,165,000	1,072,000	None
Worcester Consolidated St. Ry., Worcester	1930	(d)	(d)	(a)	(d)
Michigan					
Houghton County Traction Co., Houghton	1921	32.15	957,200	660,000	None
Missouri					
Kansas City, Clay County & St. Joseph Ry., Kansas City	1930	74.06	4,000,000	2,676,000	None
Southwest Missouri R.R., Webb City	1926	51.96	525,000	2,341,000	None
New York					
Binghamton Ry., Binghamton (4)	1925	42.93	None	None	None
Buffalo & Erie Ry., Fredonia	1928	95.56	1,450,500	910,300	None
Buffalo & Lackawanna Traction Co., Buffalo	1918	8.80	55,000	1,000,000	None
Eighth & Ninth Avenues Ry., New York	1927	37.84	(b)	None	None
Empire State R.R., Syracuse	1927	76.31	2,950,000	2,732,000*	None
Hamburg Ry., Buffalo	1920	16.00	None	750,000	8,000
New York & Queens County Ry., Jackson Heights	1923	32.49	3,235,000	1,300,000	None
New York State Rys., Rochester	1929	254.14	23,814,900	26,087,000	None
Schenectady Ry., Schenectady	1930	116.66	4,100,000	2,676,000	None
Steinway Ry., New York	1922	31.11	None	1,500,000	None
United Traction Co., Albany	1929	112.10	12,500,000	6,500,000	None
Ohio					
Indiana, Columbus & Eastern Traction Co., Springfield (5)	1921	153.25	4,025,000	6,400,000	260,359
Springfield Ry., Springfield	1928	40.54	1,500,000	1,335,400	None
Toledo, Fostoria & Findlay Ry., Fostoria	1930	64.00	1,500,000	64,000	8,500
Oklahoma					
Oklahoma Union Ry., Tulsa	1929	18.60	1,500,000	750,000	None
Pennsylvania					
Sunbury & Selinsgrove Ry., Selinsgrove	1929	6.20	220,100	13,400	None
Utah					
Salt Lake & Utah R.R., Salt Lake City	1925	97.55	5,043,700	2,532,320	260,000
Net receiverships Dec. 31, 1930	....	3,033.78	$133,916,805	$237,347,476	$586,859

(a) 250,000 shares. No par value.
(b) 58,000 shares. No par value.
(c) Included in other Chicago companies.
(d) Information not available.
(1) Sold at foreclosure in 1927. Receiver not yet discharged.
(2) Sold at foreclosure in 1929. Now operating as Calumet Rys. Receiver not yet discharged.
(3) Track of three subsidiary companies, namely: Indianapolis, Crawfordsville & Danville Elec. Ry., Indianapolis & Martinville Rapid Transit Co. and Indianapolis & Northwestern Traction Co. abandoned. Figures include all securities of subsidiary companies.
(4) Reorganized as Triple Cities Traction Co. in 1929. Receiver not yet discharged.
(5) Sold at receiver's sale in 1929. Operating as part of Cincinnati & Lake Erie R.R. Receiver not yet discharged.
* Syracuse, Lake Shore & Northern $2,496,000 and Auburn & Northern Elec. R.R. $236,000 make this figure..

In view of the reduced earning power of many companies during the past year, it is a matter of no surprise that the number of receiverships has increased. Altogether, thirteen companies applied for the protection of the courts. Of this number, however, four were the Chicago properties previously referred to, and do not involve any inability to earn a return on the investment. The year's record, shown in detail in Table VII, gives a total of 1,431 miles of track involved in receiverships during the year. The par value of stock is $85,358,800, and the face value of bonds is $108,372,110. These amounts are considerably larger than those in 1929, as may be seen in Table VIII.

On the other side of the picture, eight companies solved their financial difficulties and terminated receiverships during the year. The total of these, compared with previous years, is given in Table IX and the detail in Table X. It will be seen that almost exactly twice as great a total of track and of securities were cleared for the eight companies in 1930 as for the ten companies that come out of receivership in 1929. More than 1,000 miles of track and $80,000,000 of securities were taken out. Most of the receiverships were terminated through foreclosure sales, leaving the way clear in each instance for a new financial set-up with a capital structure better fitted to meet the needs of the day than the one that preceded it.

The largest property to be reorganized was the former Union Traction Company of Indiana, which was sold to the Insull interests and reorganized as the Indiana Railroad. The Key System Transit Company, which went into receivership during the year, was sold and divided into several separate companies. This change should result in a better operating organization and bring financial stability.

After being in receivership since 1909, the Second Avenue Railroad, of New York City, finally was reorganized. The holders of receiver's certificates agreed to take stock in the new company pro rata in settlement of their claims. There are no bonds outstanding.

The list of companies remaining in receivership at the beginning of this year is given in Table II. It is slightly less in track mileage involved than the corresponding list of a year ago, although, on account of the inclusion of the South Side Lines of Chicago the total of securities involved is somewhat greater.

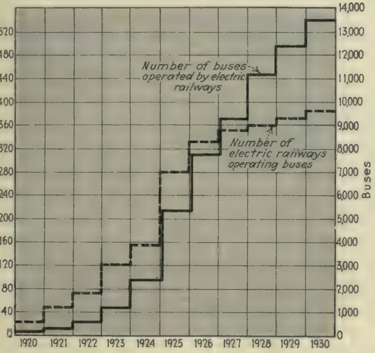
Chief among the properties likely to come out of receivership during the year is, of course, the Chicago Surface Lines group, which includes those mentioned in the last paragraph. During the last year an ordinance was drafted that was satisfactory to the owners of the several properties operating local service in the city, including the elevated lines. This ordinance required submission to the voters at a referendum. It was approved by an overwhelming majority. The plan as submitted was the outcome of a demand for unification of all the local facilities. It includes the consolidation of the constituent companies making up the Chicago Surface Lines with the Chicago Elevated Railroads, and the establishment of a single financial and operating organization. When the plan is operative, it will provide for refunding of the indebtedness of the various properties, the retirement of all the outstanding securities except a few outstanding long-term bonds of the Elevated, and the issue of securities of the new company to take care of the requirements. It is likely that the new plan will be in operation before the close of the year. Incidentally, it will terminate the receiverships into which the Surface Lines constituent companies have been forced

Bus Service and Equipment Increased

By

J. R. STAUFFER
Assistant Editor
Electric Railway Journal

More than 1,600 new buses bought during past year. Route extensions were over 5,000 miles. Bus service is now being given by 390 electric railway companies operating 13,522 vehicles on 26,098.63 miles of route



n recent years the number of buses operated by electric railways has increased more rapidly than the number of operating companies

EVIDENCE of the growing use of buses by the electric railways to extend their services into new territories is indicated by the relatively greater ncrease in route mileage during 1930 as compared with he increase in the number of vehicles. In general, traffic uring the past year did not warrant expanded services n existing routes and comparatively few buses, other han those needed to replace obsolete equipment, were urchased for this purpose. The establishment of feeder ines connecting with street car routes and the inauguraion of intercity and interstate services marked the eforts of many railways' bus operations. Only slightly ore than 650 single-track miles of railways were relaced by bus service.

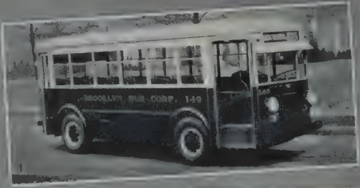
In comparison with the 1929 survey, new bus purhases during the past year were approximately 10 per ent less. Bus route extensions, on the other hand, were lmost 45 per cent greater. This year the railways purhased nearly 1,800 buses and added well over 5,000 iles to their bus systems.

The total number of buses purchased by 171 companies during 1930 was 1,768, of which 1,614 were new vehicles and 154 were bought second hand. A number of the latter were acquired with the absorption of lines purchased from independent operators. At the same time there were approximately 750 buses disposed of by the railways. The average age of these scrapped vehicles was about 5½ years. The net gain for the year in vehicles operated was close to 1,000. The total number of buses scrapped prior to this year corresponds approximately with the purchases before 1925. The number scrapped during the present year is less than one-third of the 1925 purchases. Since the average retirement age is between five and six years, this indicates a substantial volume of deferred buying.

As during 1929, a large number of the buses purchased were of the de luxe type, being used in most instances for higher class interurban service. An equal number of city type buses, however, was included in the orders for the year, most of them being used to retire obsolete equipment. In size, the great majority of purchasers favored the large seating capacity vehicles. Considerably over 50 per cent of the buses purchased had seating capacities of 29 to 40. The next largest group purchased, or about 25 per cent, were of the 21 to 25 seating capacity type.

Despite the inclination of a number of railway operators to discontinue the double-deck type of bus, twelve of them were purchased this year by the United Railways & Electric Company, Baltimore, Md. These buses have seats for 69 passengers and are of the gas-electric type, built to develop 150 hp. Two other large orders for gas-electric equipment were placed by the Department of Street Railways, Detroit, Mich., and Public Service Co-ordinated Transport, Newark, N. J. The former company purchased 51 and the latter 163 for use in city service.

Public Service Co-ordinated Transport, Newark, N. J., this year purchased 381 new buses. Of these, 200 were of the de luxe type, ranging in seating capacities from 29 to 33 passengers and 181 were large size city service vehicles. The majority of these new buses replaced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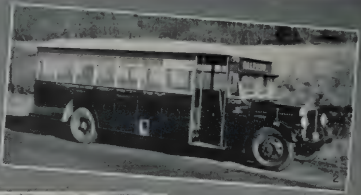
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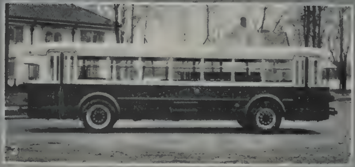
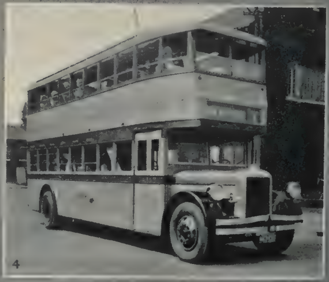


Types of bus equipment bought by electric railways during 1930

1. Small Twin Coach for Brooklyn.
2. Model 65A White for Middlesex & Boston Street Railway.
3. Large capacity Twin Coach.
4. Double-deck Yellow for Baltimore.
5. Mack city type for Denver.
6. A.C.F. Metropolitan Coach for Detroit.
7. Yellow Coach with rear exit for Toronto.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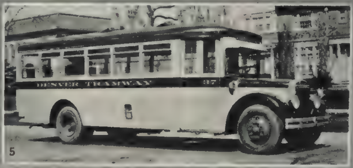
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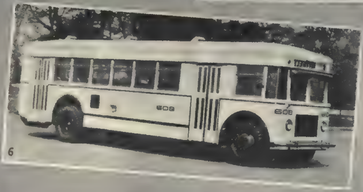
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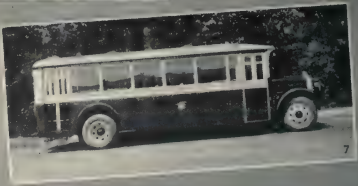
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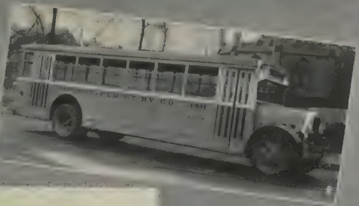


Types of bus equipment bought by electric railways during 1930 (continued)

8. Studebaker 21 passenger for Eastern Mass. St. Ry.
9. Yellow 38 passenger for Springfield, Mass.
10. Ford buses for Willapa Electric Company.
11. Capital Traction Company's 29-passenger A.C.F.
12. Twin Coach with center exit for Houston.

Summary of Bus Equipment and Operations by Electric Railways

Company	Total Buses Operated Jan. 1, 1931	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
Alabama						
Al bama Pwr. Co. (Gadsden)	4	...	..	....	....	..
Sheffield)	6	...	..	....	....	..
Bi mingham Elec. Co.	4	...	..	....	....	..
*S lma Elec. Ry	5	...	..	....	....	..
Arizona						
Ph enix St. Ry	3	...	..	....	....	..
Tu son Rapid Transit Co.	8	5	4	Reo	Fitzjohn	21
			1	Dodge	Dodge	21
*W arren Co	6	...	..	....	....	..
Arkansas						
Ar ansas Pwr. & Lt. Co.						..
Little Rock)	10	...	..	....	....	
Pine Bluff)	3	3	3	White	Bender	15
In ercity Terminal Ry	9	...	..	....	....	..
California						
Ba ersfield & Kern Elec. Ry.	5	...	..	....	....	..
Eu eka St. Ry	1	...	..	....	....	..
Ke System, Ltd	67	10	2	Twin	Twin	40
			8	Twin	Twin	21
Lo Angeles Ry	195	13	7	White	Bender	29
			1	Fageol	Fageol	29
			1	....	....	29
(C Los Angeles Motor Bus Co.	74	1	1	Twin	Twin	40
M rket St. Ry	6	...	..	....	....	..
M nic. Ry. San Francisco	18	3	3	Twin	Twin	28
Pa ific Elec. Ry	141	12	12	Twin	Twin	24
Pa ific Gas & Elec. Co.	11	1	1	Yellow	Yellow	23
Pe insular Ry	11	3	3	A.C.F.	A.C.F.	21
Sa ramento Northern Ry.	1	...	..	....	....	..

Company	Total Buses Operated Jan. 1, 1930	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
California—Continued						
San Diego Elec. Ry	35	3	2	Twin	Twin	40
			1	A.C.F.	A.C.F.	40
San Francisco, Napa & Calistoga R.R.	1	...	..	....	....	..
Napa Valley Bus Co.						
San Jose R.R.	1	...	..	....	....	..
Stockton Elec. Ry	2	2	2	A.C.F.	A.C.F.	23
*Union Traction Co., Santa Crus	5	...	..	....	....	..
Colorado						
Colorado Springs & Interurban Ry	5	...	..	....	....	..
*Denver & Interurban Motor Co	10	...	..	....	....	..
*Denver & South Platte Transp. Co	2	...	..	....	....	..
Denver Tramway	39	22	12	White	Bender	25
Bus Transp.			1	White	Bender	29
Fitzsimons Bus & Taxi Co.			1	Yellow	Yellow	23
			8	Mack	Mack	29
Grand River Valley Ry	2	...	..	....	....	..
Public Service Co. of Colo.	1	...	..	....	....	..
Connecticut						
Connecticut Co	201	37	10	Yellow	Yellow	29
			5	Yellow	Yellow	38
			8	Yellow	Yellow	37
			5	Mack	Mack	..
			‡9	Misc.		
*Danbury Transp. Co.	17	...	..	....	....	..
*Groton & Stonington Traction Co	14	...	..	....	....	..
*Lordship Ry	5	...	..	....	....	..
*New Haven & Shore Line Ry	15	2	2	Twin	Twin	24
Waterbury & Mildale Tramway	3	...	..	....	....	..

Operates buses only.
Gas-electric.
Second-hand.
A) Subsidiaries of Chicago Surface Lines.
B) Buses leased.
C) Jointly owned by Pacific Elec. Ry. and Los Angeles Ry.

Summary of Bus Equipment and Operations by Electric Railways—(Continued)

Company	Total Buses Operated Jan. 1, 1931	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
Delaware						
Delaware Elec. Pwr. Co....	24	4	2	Yellow	Yellow	29
Delaware Bus Co.			2	Yellow	Yellow	31
District of Columbia						
Capital Traction Co.......	43	1	1	A.C.F.	A.C.F.	29
Wash'n & Old Dominion Ry	1	...	..	...	...	..
Washington Ry. & Elec. Co.	123	23	16	Yellow	Yellow	29
			‡7	Yellow	Yellow	29
Florida						
Jacksonville Traction Co...	8	4	‡4	Reo	Reo	21
*Key West Elec. Co........	5	...	..	...	...	..
Miami Beach Ry..........	50	..	..	...	...	..
Municipal Ry. of St. Petersburg..................	8	...	..	...	...	..
Tampa Elec. Co..........	19	...	..	...	...	..
Georgia						
Columbus Elec. & Pwr. Co..	22	...	..	...	...	..
Columbus Transp. Co.						
Georgia Pwr. Co. (Atlanta)	33	...	..	...	...	..
Atlanta Coach Co.						
(Athens)..	5	5	5	Yellow	Yellow	23
(Rome)	4	...	..	...	...	..
Savannah Elec. & Pwr. Co..	18	...	..	...	...	..
Idaho						
*Boise St. Car Co..........	11	...	..	...	...	..
Illinois						
Alton Ry.................	5	...	..	...	...	..
Aurora, Elgin & Fox River Elec. Co...............	11	6	6	A.C.F.	A.C.F.	23
Central Illinois Public Service Co.................	6	...	..	...	...	..
*Central Illinois Traction Co....................	2	2	2	Yellow	Yellow	21
Chicago, Aurora & Elgin R.R.	1	...	..	...	...	..
Western Motor Coach Co.						
(*A*) Chicago Rys..........	7	2	2	Twin	Twin	40
(*A*) Chicago City Ry......	3	...	..	...	...	..
Chicago & Illinois Valley R.R.	10	..	..	...	...	..
Chicago & Joliet Elec. Ry...	21	4	3	Reo	Reo	21
Chicago & Joliet Transp. Co.			1	Yellow	Yellow	29
Metropolitan Motor Coach Co. (Chicago)...........	72	5	5	A.C.F.	A.C.F.	21
Chicago & West Towns Ry..	48	7	‡2	Pierce	Pierce	25
			‡1	Yellow	Yellow	25
			‡4	White	White	21
E. St. Louis & Suburban Ry.	5	...	..	...	...	..
Blue Goose Line						
East St. Louis Ry.........	13	...	..	...	...	..
Evanston Ry.............	27	...	..	...	...	..
Evanston & Niles Center Bus Co.						
Illinois Central (Elec. Div.).	1	...	..	...	...	..
Illinois Pwr. Co...........	19	...	..	...	...	..
Illinois Pwr. & Lt. Corp.						
(Bloomington)..........	8	..	..	...	...	..
(Champaigne)..........	18	3	3	Yellow	Yellow	29
(Danville).............	5	...	..	...	...	..
(Decatur)..............	24	3	3	Yellow	Yellow	29
(Galesburg)............	21	2	2	Yellow	Yellow	21
(Granite City)..........	5	5	5	A.C.F.	A.C.F.	23
(Jacksonville)...........	5	...	..	...	...	..
(Peoria)...............	31	3	3	A.C.F.	A.C.F.	29
(Quincy)...............	27	...	..	...	...	..
(St. Louis).............	10	10	10	Mack	Mack	29
Illinois Terminal R.R.......	18	...	..	...	...	..
*Joliet, Plainfield & Aurora Transp. Co.............	7	1	1	Yellow	Yellow	21
Kewanee Public Service Co..	2	...	..	...	...	..
Rockford Elec. Co.........	26	...	..	...	...	..
Rockford & Interurban Ry..	10	...	..	...	...	..
St. Louis & Alton Ry......	2	2	2	A.C.F.	A.C.F.	25
Tri-City Ry. of Ill.........	6	...	..	...	...	..
Indiana						
Beech Grove Traction Corp.	8	...	..	...	...	..
Chicago, South Shore & South Bend R.R........	107	...	..	...	...	..
Shore Line Motor Coach Co.						
Evansville Suburban & Newburg Ry................	3	3	3	White	White	25
Evansville & Ohio Valley Ry.	10	2	2	Yellow	Yellow	21
Gary Rys...............	6	...	..	...	...	..
Indianapolis St. Ry........	27	...	..	...	...	..
Peoples Motor Coach Co.	63	...	..	...	...	..
Indianapolis & Southeastern R.R..................	10	...	..	...	...	..
Indiana R.R..............	49	...	..	...	...	..
Indiana Service Corp......	12	...	..	...	...	..
Interstate Public Service Co.	29	...	..	...	...	..
Northern Indiana Ry.......	23	...	..	...	...	..
Northern Indiana Pwr. Co..	5	...	..	...	...	..
So. Ind. Gas & Elec. Co.	17	...	..	...	...	..
Terre Haute, Indianapolis & Eastern Traction Co...	49	...	..	...	...	..
Indiana Motor Transit Co.						
T. H. I. & E. (Terre Haute Div.).................	19	...	..	...	...	..
Iowa						
Cedar Rapids & Iowa City R.R..................	19	...	..	...	...	..
Clinton, Davenport & Muscatine Ry...............	3	...	..	...	...	..
Des Moines & Cen. Ia. R.R.	3	...	..	...	...	..
*Des Moines Elec. Lt. Co...	6	..	..	...	...	..
Des Moines Ry...........	8	1	1	White	Bender	29
Ft. Dodge, Des Moines & Southern R.R...........	39	8	4	A.C.F.	A.C.F.	21
Ft. Dodge, Des Moines & South. Transp. Co.			2	Yellow	Yellow	21
			[illegible]	Yellow	Yellow	33
Fort Madison St. Ry.......	7	5	5	Yellow	Yellow	23
Interstate Pwr. Co.........	9	...	..	...	...	..
*Iowa Ry. & Lt. Co. (Marshalltown)..............	9	...	..	...	...	..
Iowa Ry. & Lt. Co.........	21	12	6	Yellow	Yellow	21
Crandic Stages			4	Yellow	Yellow	33
			2	Yellow	Yellow	29
Iowa Southern Utilities Co.						
(Burlington)............	29	...	..	...	...	..
(Ottumwa)............	23	17	17	Mack	Mack	25
Mississippi Valley Elec. Co..	14	9	9	Yellow	Yellow	23
Waterloo, Cedar Falls & Northern Ry..........	11			...	...	..
Tri-City Ry..............	15			...	...	.
Kansas						
Kansas City, Leavenworth & Western Ry.........	13	1	1	Mack	Mack	29
Leavenworth Transp. Co.						
Kansas Pwr. & Lt. Co.....	39	...	..	...	...	..
Kansas Public Service Co...	2	.		...	...	..
Salina St. Ry.............	2	.		...	...	..
United Pwr. & Lt. Corp....	3	.	..	...	...	..
Wichita R.R. & Lt. Co.....	55	5	5	Yellow	Yellow	21
Wichita Motor Bus Co.						
Kentucky						
Kentucky Traction & Terminal Co..............	241	79	6	White	White	29
Kentucky Coach Co.			6	Yellow	Yellow	29
Consolidated Coach Corp.			‡8	Yellow	Yellow	..
			‡11	Studbkr.	Studbkr.	..
			‡38	White	White	..
			‡10	Misc.	Misc.	..
Kentucky Utilities Co......	12	...	..	...	...	..
Louisville Ry.............	47	6	2	White	Bender	29
Kentucky Carriers, Inc.			4	Mack	Mack	29
Owensboro City R.R.......	2	2	2	Yellow	Yellow	21
Louisiana						
Baton Rouge Elec. Co......	3	...	..	...	...	..
*Louisiana Elec. Co........	7	...	..	...	...	..
*Louisiana Pwr. & Lt. Co...	16	10	10	White	Bender	27
Mun. St. Ry., Alexandria..	25	...	..	...	...	..
Municipal St. Ry., Monroe.	4	4	4	Dodge	Dodge	21
New Orleans Public Service.	44	12	12	Yellow	Yellow	38
Maine						
York Utilities Co..........	5	...	..	...	...	..
Maryland						
*Cumberland & Westernport Transit Co.............	15	1	‡1	Lincoln	Special	12
Potomac Edison Co........	102	17	6	Yellow	Bender	25
Blue Ridge Transp. Co.			11	Yellow	Yellow	21
United Rys. & Elec. Co.....	109	12	†12	Yellow	Yellow	69
Baltimore Coach Co						
Washington, Baltimore & Annapolis Elec. R.R.....	3	...	..	...	...	..
Massachusetts						
Berkshire St. Ry..........	26	22	22	...	...	..
Boston Elevated Ry.......	367	66	43	A.C.F.	A.C.F.	40
			22	Twin	Twin	39
			1	Yellow	Yellow	38
Boston, Revere Beach & Lynn Ry...............	2	...	..	...	...	..
Point Shirley St. Ry.....						
Boston, Worcester & New York St. Ry............	23	12	12	White	Bender	..
Eastern Mass. St. Ry......	114	28	13	Studbkr.	Superior	21
			4	Studbkr.	Superior	25
			5	White	Bender	29
			6	A.C.F.	A.C.F.	38
East Taunton St. Ry......	2	...	..	...	...	..
Fitch'g & Leominster St. Ry.	8	1	1	Studbkr.	Studbkr.	21
*Gardner-Templeton St. Ry.	8	1	1	White	Bender	29
Holyoke St. Ry...........	5	2	2	Mack	Mack	29
Interstate St. Ry..........	17	3	3	Twin	Twin	29
Massachusetts Northeastern St. Ry.................	17	17	17	A.C.F.	A.C.F.	23
*Middlesex & Boston St. Ry.	106	9	9	White	Bender	29
*Milford, Framingham, Hopedale & Uxbridge Coach Co.............	7	...	..	...	...	..
Northampton St. Ry......	4	...	..	...	...	..
*Ply'th & Brockton St. Ry..	11	3	‡3	Mack	Mack	29
Springfield St. Ry.........	61	9	9	Yellow	Yellow	38
Union St. Ry............	19	2	1	Yellow	Yellow	23
			1	Yellow	Yellow	29
Worcester Consol. St. Ry...	62	1	1	Yellow	Yellow	38
Michigan						
City of Detroit, St. Rys....	548	59	3	Twin	Twin	38
			†50	A.C.F.	A.C.F.	38
			3	Yellow	Yellow	29
			2	Lincoln	A.C.F.	15
			†1	Twin	Twin	38
Eastern Michigan Rys......	324	25	10	A.C.F.	A.C.F.	29
Eastern Michigan Motor Buses			15	Yellow	Yellow	33
*Grand Rapids, Grand Haven & Muskegon Ry...	6	...	..	...	...	.
Grand Rapids R.R.........	13			...	...	.
Houghton Co. Traction Co.	4			...	...	.
Copper Country Bus Line						

Summary of Bus Equipment and Operations by Electric Railways—(Continued)

Company	Total Buses Operated Jan. 1, 1931	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
Kalamazoo Transp. Co.	11	...	..	...	...	..
Lansing Transp. Co.	20	...	..	...	...	..
*Menominee & Marinette Lt. & Traction Co.	15	...	..	...	...	..
So. Michigan Transp. Co.	50	...	..	...	...	..
Saginaw Transit Co.	37	...	..	...	...	..
Minnesota						
Duluth St. Ry. *Duluth Superior Coach Co.*	16	...	..	...	...	..
Twin City Rapid Transit Co *Twin City Motor Bus Co.*	107	18	14	Will	Ecklund	30
			2	White	Ecklund	30
			2	Mack	Ecklund	30
Mississippi						
Gulfport & Miss. Coast Traction Co.	19	...	..	...	...	..
Mississippi Pwr. Co. (Gulfport)	16	2	2	Reo	Reo	17
(Hattiesburg)	7	...	..	...	...	..
(Meridian)	7	...	..	...	...	..
Mississippi Pwr. & Lt. Co. (Greenville)	4	...	..	...	...	..
(Vicksburg)	3	1	1	Dodge	Dodge	21
Missouri						
City Lt. & Traction Co.	3	...	..	...	...	..
Kansas City Pub. Serv. Co.	74	...	..	...	...	..
Kansas City, Clay County St. Joseph Ry. *Kansas City, Clay County & St. Joseph Auto Transit Co.*	12	...	..	...	...	..
Kansas City Pub. Serv. Co.	74	...	..	...	...	..
Missouri Pwr. & Lt. Co.	2	...	..	...	...	..
Springfield Traction Co.	14	2	2	Yellow	Yellow	23
St. Louis Water Works Ry.	5	2	2	A.C.F.	A.C.F.	23
St. Joseph Ry., Lt., Ht. & Pwr. Co.	20	3	3	Mack	Mack	29
St. Louis Public Service Co.	59	7	‡2	Yellow	Yellow	21
			‡5	Yellow	Yellow	29
Montana						
Butte Elec. Ry.	5	...	..	...	...	..
Nebraska						
Lincoln Traction Co.	22	2	2	Mack	Mack	25
Omaha & Council Bluffs St. Ry.	27	...	..	...	...	..
New Hampshire						
*Dover, Somersworth & Rochester St. Ry.	6	...	..	...	...	..
*Keene Elec. Ry.	7	...	..	...	...	..
*Laconia St. Ry. *Laconia Transit Co.*	5	...	..	...	...	..
Nashua St. Ry.	6	1	1	Mack	Mack	29
*Portsmouth Elec. Ry.	12	...	..	...	...	..
New Jersey						
Atlantic City & Shore R.R.	20	...	..	...	...	..
Coast Cities Ry.	47	14	8	Yellow	Yellow	21
			6	Yellow	Yellow	32
Cumberland Traction Co.	1	...	..	...	...	..
Five-Mile Beach Ry.	6	...	..	...	...	..
*N. J. Interurban Coach Co.	11	1	1	Yellow	Yellow	29
Ocean City Elec. R.R.	1	...	..	...	...	..
Public Service Co-Ord. Trans.	2,425	381	167	Yellow	P.S.C.T.	32
			18	Yellow	P.S.C.T.	35
			†142	Yellow	P.S.C.T.	37
			1	Yellow	P.S.C.T.	16
			†10	Yellow	Yellow	39
			20	A.C.F.	A.C.F.	33
			11	White	Bender	29
			†5	Mack	Mack	25
			†6	Mack	Mack	29
			1	Mack	Mack	40
Trenton Transit Co.	45	10	5	Twin	Twin	22
			5	Twin	Twin	36
New York						
Black River Traction Co. *Watertown Transp. Co.*	16	...	..	...	...	..
Brooklyn-Manhattan Transit Corp.	1	1	1	Yellow	Yellow	38
Brooklyn & Queens Transit Corp. *Brooklyn Bus Corp.*	45	17	6	Twin	Twin	40
			4	Twin	Twin	23
			2	Mack	Mack	29
			5	Mack	Mack	38
Buffalo & Erie Ry. *Buffalo & Erie Coach Co.*	6	...	..	...	...	..
Cortland County Trac. Co. *Cortland County Bus Lines*	3	...	..	...	...	..
Eastern N. Y. Utilities Corp. *Eastern N. Y. Transp. Co.*	3	...	..	...	...	..
Fishkill Elec. Ry.	6	5	5	Mack	Mack	21
Fonda, Johnstown & Gloversville R.R.	10	6	6	Mack	Mack	..
*Geneva, Seneca Falls & Auburn R.R.	3	...	..	...	...	..
Hamburg Ry.	16	...	..	...	...	..
*Hudson Valley Ry. *Hudson Transp. Co.*	24	...	..	...	...	..
*Huntington Traction Co. *Huntington Coach Corp.*	5	...	..	...	...	..
International Ry. *International Bus Corp.*	89	...	..	...	...	..
Jamaica Central Rys.	3	3	3	Mack	Mack	29
Jamestown St. Ry. *Jamestown Motor Bus Transp. Co.*	21	...	..	...	...	..
Kingstown Consolidated R.R. *Kingston City Transp. Co.*	14	8	8	Yellow	Yellow	24
*Newburgh Pub. Serv. Co.	22	...	..	...	...	..
*New York & Stamford Ry.	62					
County Transp. Co.		...	..	...	...	..
New York State Rys. (Rochester) *Roc. Interurban Bus Co.* *Roc. Rys. Co-ord Bus Lines* *East Ave. Bus Co.* *Darling Bus Line*	80	...	..	...	...	..
New York State Rys. (Syracuse) *Syr. Rys. Co-ord. Bus Line*	32	...	..	...	...	..
New York State Rys. (Utica) *Utica Rys. Co-ord. Bus Line*	14	...	..	...	...	..
Niagara Gorge R.R. *Niagara Gorge Bus Line*	6	...	..	...	...	..
*Peekskill Ltg. & R.R. Corp. *Peekskill Motor Bus Corp.*	29	...	..	...	...	..
*Port Jervis Transit Co.	2	...	..	...	...	..
Poughkeepsie & Wappingers Falls Ry.	7	1	1	A.C.F.	A.C.F.	33
Schenectady Ry. *Schenectady Rapid Tr. Co.*	40	17	17	Twin	Twin	40
Syracuse & Eastern R.R. *Syra. & Eastern Bus Lines*	6	...	..	...	...	..
Southern New York Ry. *Manson Transp. Co.*	4	...	..	...	...	..
Third Avenue Ry. *Surface Transp. System*	208	30	30	White	White	..
Triple Cities Traction Corp. *Triple Cities Bus Lines, Inc.*	24	4	2	A.C.F.	A.C.F.	23
			2	A.C.F.	A.C.F.	27
United Traction Co. *Capitol Dist. Transp. Co.*	90	2	2	Twin	Twin	24
*Walkill Transit Co.	8	...	..	...	...	..
Waverly, Sayre & Athens Trans. Co.	5	...	..	...	...	..
North Carolina						
Carolina Pwr. & Lt. Co.	3	...	..	...	...	..
Durham Public Service Co.	23	12	‡5	Mack	Mack	29
			7	Mack	Mack	29
North Carolina Public Service Co. *Greensboro Bus Co.*	18	2	2	Yellow	Yellow	23
Southern Public Utilities Co.	21	1	1	White	White	..
Tidewater Pwr. Co. *Coast City Transit Co.*	2	...	..	...	...	..
North Dakota						
Grand Forks St. Ry.	2	2	2	Reo	Eckland	21
Northern States Pwr. Co. *Northern Transit Co.*	4	...	..	...	...	..
Ohio						
Akron Transp. Co.	205	...	..	...	...	..
City of Ashtabula—Div. of St. Rys.	4	...	..	...	...	..
Cincinnati & Lake Erie R.R. *Cin. & Lake Erie Bus Co.*	20	10	6	Yellow	Yellow	31
			4	Twin	Twin	31
Cincinnati, Lawrenceburg & Aurora Elec. St. Ry.	7	...	..	...	...	..
Cincinnati St. Ry.	88	30	2	Twin	Twin	21
			18	Twin	Twin	40
			10	Mack	Mack	29
City Ry. Co. (Dayton) *City & Sub. Transit Co.*	2	2	2	White	Lang	18
Cleveland Ry.	187	...	..	...	...	..
Cleveland, Ry. & Lt. Co. *Southwestern Bus Co.*	22	3	3	White	White	..
Columbus, Delaware & Marion Elec. Co.	4	...	..	...	...	..
Columbus Ry., Pr. & Lt. Co.	6	...	..	...	...	..
Community Traction Co. *Maumee Transp. Co.*	135	19	4	Mack	Mack	29
			4	White	Bender	21
			‡4	Mack	Mack	25
			‡1	Yellow	Yellow	21
			‡2	Twin	Twin	29
			‡4	Twin	Twin	25
Dayton St. Ry.	3	...	..	...	...	..
Dayton & Xenia Ry. *Dayton & Xenia Motor Bus Co.*	3	...	..	...	...	..
Dayton & Troy Elec. Ry.	3	3	3	Gramm	Wayne	20
Lake Shore Elec. Ry.	3	...	..	...	...	..
Lorain St. Ry.	8	...	..	...	...	..
Maumee Valley Co. *Maumee Vall. Transp. Co.*	13	...	..	...	...	..
Nelsonville-Athens Elec. Ry. *Nelsonville Transp. Co.*	2	1	1	Studbkr.	Cambridge	21
Ohio Public Service Co.	6	1	1	Yellow	Yellow	..
Penn-Ohio Pub. Serv. Corp.	34	...	..	...	...	..
Pioneer Transp. Co. *Columbus & Janesville Transp. Co.* *Pioneer Transp. Co.*	40	...	..	...	...	..
Portsmouth Public Service Co.	13	5	5	Dodge	Dodge	21
Springfield Ry.	1	...	..	...	...	..
Scioto Valley Ry. & Pwr. Co. *Valley Public Service Co.*	31	7	7	Studbkr.	Superior	22
Steubenville, East Liverpool & Beaver Valley Trac. Co.	3	...	..	...	...	..
West End Traction Co.	10	...	..	...	...	..
Youngstown Municipal Ry.	66	10	10	Twin	Twin	40
Youngstown & Suburban Ry. *Youngstown & Suburban Transp. Co.* *Columbiana Bus Co.* *Youngstown Suburban Tourist Lines*	13	...	..	...	...	..

Summary of Bus Equipment and Operations by Electric Railways—(Continued)

Company	Total Buses Operated Jan. 1, 1931	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
Oklahoma						
Oklahoma Ry.	54	11	2	Yellow	Yellow	21
			2	Yellow	Yellow	23
			2	Dodge	Dodge	21
			5	Dodge	....	..
Oklahoma Union Ry.	84	1	1	Mack	Lang	25
Union Transit Co.						
*Shawnee-Tecumseh Traction Co.	7	...	..	....	....	..
United Service Co.	12	5	2	Yellow	Yellow	23
			3	Dodge	Dodge	21
Oregon						
Commission of Public Docks, Portland	1	...	..	....	....	..
Oregon Elec. Ry.	1	...	..	....	....	..
Pacific N.W. Public Ser. Co.	49	2	1	A.C.F.	A.C.F.	39
			1	Twin	Twin	40
Pennsylvania						
Allentown & Reading Traction Co.	5	2	2	Mack	Mack	29
Altoona & Logan Vall. E. Ry.	23	...	..	....	....	..
Logan Valley Bus Co.						
Beaver Valley Traction Co.	11	3	3	Yellow	Yellow	21
Beaver Valley Motor Coach Co.						
*Berwick & Nes'peck St. Ry.	2	...	..	....	....	..
*Chambersburg & Shippensburg Ry.	6	...	..	....	....	..
Cumberland Valley Transp. Co.						
Conestoga Traction Co.	4	...	..	....	....	..
Conestoga Transp. Co.						
East Penn Traction Co.	10	1	1	White	Bender	29
East Penn Transp. Co.						
Erie Ry.	26	3	3	Yellow	Yellow	23
Erie Coach Co.						
Johnstown & Somerset Ry.	1	...	..	....	....	..
Johnstown Traction Co.	31	...	..	....	....	..
Traction Bus Co.						
Southern Cambria Bus Co.						
Beaverdale & S.Fork Bus Co.						
Keystone Public Service Co.	33	...	..	....	....	..
Citizens Transit Co.						
Lackawanna & Wyoming Valley R.R.	6	2	1	Mack	Mack	29
Laurel Line Bus Co.			1	White	White	25
Lehigh Traction Co.	17	2	2	Mack	Mack	25
Hazleton Auto Bus Co.						
Lehigh Valley Transit Co.	33	2	2	Mack	Mack	33
Lehigh Transp. Co.						
Lewiston & Reedsville Elec. Ry.	18	2	2	White	White	..
Lewiston Transportation Co.						
*Lewisburg, Milton & Watsonville Pass. Ry. Co.	3	...	..	....	....	..
*North Branch Bus Co.	11	1	1	A.C.F.	A.C.F.	33
Philadelphia & Westchester Traction Co.	71	19	8	White	Bender	..
Aronimink Transp. Co.			11	Twin	Twin	40
Phila. Rapid Transit Co.	341	...	..	....	....	..
Phila. Rural Transit Co.						
Pittsburgh Rys.	103	25	10	Yellow	Yellow	21
Pgh. Motor Coach Co.			3	Yellow	Yellow	29
			12	White	Bender	21
Pittsburgh, Harmony, Butler & New Castle Ry.	14	7	5	Yellow	Yellow	21
Harmony Short Line Motor Transport Co.			2	Yellow	Yellow	25
*Pocono Motor Coach Co.	12	4	‡4	Yellow	Yellow	21
Reading Transit Co.	19	13	13	Yellow	Yellow	23
Reading Transit Bus Co.						
Schuylkill Transp. Co.	21	2	2	Yellow	Yellow	29
Scranton, Montrose & Binghamton Ry.	3	1	1	Mack	Mack	25
Northern Bus Co.						
Scranton Ry.	21	5	5	White	White	29
Scranton Bus Co.						
Shamokin & Edgew. Elec. Ry.	9	...	..	....	....	..
Shamokin & Treverton Bus Line						
Shamokin & Mt. Carmel Transp. Co.	3	...	..	....	....	..
Ashland & Shamokin Auto Bus Co.						
Southern Penna. Traction Co.	38	11	6	Yellow	Yellow	29
Southern Penna. Bus Co.			‡1	Garford	Garford	25
			‡1	Reo	Reo	21
			‡1	Reo	Reo	18
			‡1	Mack	Mack	25
			‡1	Day Elder	Day Elder	21
Tarentum, Brackenridge & Butler St. Ry.	1	1	1	Studbkr.	Fitzjohn	21
Brackenridge Bus Co.						
*United Traction St. Ry.	2	...	..	....	....	..
Dubois Transit Co.						
*West Chester St. Ry.	35	...	..	....	....	..
Chester Valley Bus Line						
Westmoreland County Ry.	6	...	..	....	....	..
Chestnut Ridge Transp. Co.						
West Penn. Rys.	63	28	13	White	Lang	29
Penn Bus Lines			2	Dodge	Dodge	21
White Star Lines			‡13	Misc.	Misc.	..
Ohio Valley Transit Co.						
Westside Elec. Rys.	5	...	..	....	....	..
Westside Motor Transit Co.						
Wilkes-Barre Ry.	38	5	5	Mack	Mack	29
Wyoming Valley Autobus Co.						
Williamsport Rys.	4	1	‡1	....	....	..
Williamsport Transp. Co.						
Woodlawn & Southern St. Ry.	9	3	3	Mack	Mack	29
Rhode Island						
*Newport & Providence Ry.	34	..	..	....	....	..
United El. Rys. (Providence)	146	18	4	Twin	Twin	36
			1	White	Bender	30
			13	A.C.F.	A.C.F.	37
South Carolina						
Southern Public Utilities Co.	8	1	1	White	Carolina	20
South Dakota						
*Sioux Transit Co.	18	2	2	Yellow	Yellow	23
Tennessee						
Johnson City Traction Corp.	5	5	5	Mack	Mack	21
Memphis St. Ry.	5	5	5	Yellow	Yellow	21
Nashville Ry. & Lt. Co.	18	...	..	....	....	..
Tennessee Elec. Pwr. Co.	17	...	2	Twin	Twin	24
Tennessee Public Service Co.	6	...	...	....	....	..
Texas						
Abilene Traction Co.	5	...	..	....	....	..
Austin St. Ry.	13	4	4	Dodge	Dodge	21
Bryan College Traction Co.	2	...	..	....	....	..
Dallas Ry. & Terminal Co.	26	6	6	Dodge	Dodge	21
Eastern Texas Elec. Co.	29	5	2	Yellow	Yellow	25
J. G. Holtzclaw Bus Line			3	Twin	Twin	25
El Paso Elec. Co.	17	10	2	Twin	Twin	21
			2	Twin	Twin	24
			4	Reo	Fitzjohn	21
			‡2	Reo	Fitzjohn	21
Houston Elec. Co.	86	14	3	Twin	Twin	21
			1	White	Bender	25
			10	Twin	Twin	25
Northern Texas Traction Co.	36	10	7	White	White	29
			3	Reo	Reo	21
Nueces Ry.	9	5	5	Chevrolet	Wayne	16
*Rio Grande Valley Trac. Co.	3	...	..	....	....	..
San Antonio Pub. Serv. Co.	94	5	5	Chevrolet	....	16
*Southwestern Transit Co.	4	...	..	....	....	..
Texas Elec. Ry.	6	...	..	....	....	..
Wichita Falls Traction Co.	11	...	..	....	....	..
Utah						
Bamberger Elec. R.R.	2	...	..	....	....	..
Bamberger Transp. Co.						
Utah Lt. & Traction Co.	12	1	1	Mack	Mack	26
Utah-Idaho Central R.R.	5	...	..	....	....	..
Utah Rapid Transit Co.	2	...	..	....	....	..
Vermont						
*Burlington Rapid Transit Co.	21	1	1	White	Bender	..
*Twin State Gas & Elec. Co.	3	...	..	....	....	..
Virginia						
Lynchburg Trac. & Lt. Co.	3	...	..	....	....	..
Petersburg, Hopewell & City Point Ry.	3	...	..	....	....	..
Roanoke Ry. & Elec. Co.	6	...	..	....	....	..
Virginia Elec. & Pwr. Co.	228	19	1	Reo	Fitzjohn	21
			8	White	Bender	29
			10	Yellow	Yellow	21
Virginia Public Service Co.	9	4	2	Yellow	Yellow	23
Citizen's Rapid Transit Corp.			2	Reo	Fitzjohn	20
Washington						
Grays Harbor Ry. & Lt. Co.	13	...	..	....	....	..
North River Transp. Co.						
Twin City Transit Co.						
Lewiston-Clarkston Tran. Co.	4	...	..	....	....	..
Puget Sound Pwr. & Lt. Co.	108	22	6	A.C.F.	Heiser	34
North Coast Trans. Co.			10	A.C.F.	Heiser	30
			1	White	White	..
			‡4	Lincoln	....	11
			‡1	Pierce	....	11
Seattle Municipal St. Ry.	52	5	5	Mack	Mack	32
Seattle & Ranier Valley Ry.	2	...	..	....	....	..
Tacoma Municipal Belt Line	1	...	..	....	....	..
Tacoma Ry. & Pwr. Co.	21	3	1	Mack	Mack	37
Tacoma Bus Co.			1	Mack	Mack	29
			‡1	Mack	Mack	29
Willapa Elec. Co.	3	3	3	Ford	Wayne	20
Yakima Valley Transp. Co.	3	...	..	....	....	..
West Virginia						
Charleston Interurban R.R.	6	...	..	....	....	..
Midland Trail Transit						
New River Transit						
Red Bird						
Monongahela-West Penn Public Service Co.	46	...	..	....	....	..
Mon'hela Transport Co.						
Ohio Valley Elec. Ry.	18	...	..	....	....	..
Ohio Valley Bus Co.						
Wheeling Public Service Co.	10	2	2	Studbkr.	Superior	25
Bus Transp. Co.						
Wisconsin						
Madison Rys.	8	...	..	....	....	..
Milwaukee El. Ry. & Lt. Co.	169	22	5	Twin	Twin	38
Wis. Motor Bus Lines			5	Yellow	Yellow	21
			4	Twin	Twin	35
			8	Misc.	....	....
Mississippi Val. Pub. Serv.	6	4	4	Yellow	Yellow	21
Wisconsin Gas & Elec. Co.	11	...	..	....	....	..
Wisconsin Michigan Pwr. Co.	20	...	..	....	....	..
Intercity Bus Co.						

Summary of Bus Equipment and Operations by Electric Railways—(Continued)

Company	Total Buses Operated Jan. 1, 1930	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
Wisconsin Pwr. & Lt. Co....	85	13	4	Yellow	Yellow	21
			8	Yellow	Yellow	23
			‡1	Reo	Reo	21
Wisc. Pub. Serv. Corp.....	20	2	2	White	Bender	23
Wisconsin Valley Elec. Co.. *Valley Transit Co......*	7	...	..	....	....	..
Wyoming						
*Cheyenne Motor Bus Co...	9	2	1	Reo	Fremont	21
			1	Reo	....	21
Hawaii						
Honolulu Rapid Transit Co.	12	...	..	....	....	..
Philippine Islands						
Manila Elec. Co...........	82	...	..	....	....	..
Porto Rico						
Ponce Elec. Co............	4	...	..	....	....	..
Canada						
Brantford Municipal Ry....	1	...	..	....	....	..
British Columbia Elec. Ry..	28	5	3	Yellow	Yellow	23
British Columbia Rapid Transit Co.			2	White	Bender	21
Grand River Ry.......... *Canadian Pacific Transport Co.*	3	...	..	....	....	
Hamilton St. Ry..........	28	...	..	....	....	..
Hydro Elec. Rys........	20	12	3	Yellow	Yellow	21
			9	Misc.	Misc.	..

Company	Total Buses Operated Jan. 1, 1931	Total Bought in 1930	No. Each Type	Chassis	Body	Seats
*Hamilton Bus Lines......	65	...	..	....	....	..
Levis Tramways..........	1	...	..	....	....	..
London St. Ry............	23	12	12	Yellow	Yellow	23
Montreal Tramways.......	123	23	1	Mack	Mack	29
			5	Leyland	Leyland	29
			5	Leyland	Can. C. & F.	29
			5	White	Bender	29
			5	White	Can. C. & F.	29
			2	Asso. Equip.	Can. C. & F.	29
Moose Jaw Elec. Ry.......	3	...	..	....	....	.
New Brunswick Pwr. Co....	1	...	..	....	....	..
Niagara, St. Catherines & Toronto Ry............	3	...	..	....	....	..
Ottawa Elec. Ry..........	16	2	1	Reo	Reo	21
Grey Line			1	Godfredson	Godfredson	25
Pictou County Elec. Co.....	11	4	3	Reo	Ottawa Car	21
			1	Intern'l	MacDonald	25
Quebec Ry., Lt. & Pwr. Co..	12	...	..	....	....	..
Sherbrooke Ry. & Pwr. Co..	5	1	‡1	Reo	....	18
(*B*) Three Rivers Traction Co......................	3	...	..	....	....	..
Toronto Transp. Comm'n	236	30	15	Yellow	T.T.C.	27
Gray Coach Lines			15	Leyland	T.T.C.	27
Winnipeg Elec. Ry........	49	1	1	Mack	....	29
*Woodstock, Thames Valley & Ingersoll Elec. Ry.....	3	...	..	....	....	..

obsolete equipment as this company reported scrapping 332 buses, while the remainder were used in the extension of their interstate service.

Mileage extensions reported by a number of railways amounted to 5,653.99 miles in 1930. In contrast to these extensions a few railways reported abandonment of some bus operations and the sale of others. Nearly 1,400 route-miles were thus relinquished. The following companies made the largest extensions to their systems: The Connecticut Company added 99.08 miles; Fort Dodge, Des Moines & Southern Railroad extended 208.29 miles; the Kentucky Traction & Terminal Company added 1,640 miles, and Public Service Co-ordinated Transport increased its total mileage to 2,698.69 miles by extending its services 912.16 in 1930. Other large extensions were Cincinnati & Lake Erie, 218 miles; Milwaukee Electric Railway & Light Company, 457 miles, and the Wisconsin Power & Light Company, 391 miles.

Nine railways reported the inauguration of bus service during 1930. These companies purchased a total of 42 buses.

Bus Route Extensions, City and Intercity

	Miles
Alabama	
Alabama Pwr. Co. (Gadsden).............	1.50
Arizona	
T acson Rapid Transit Co................	4.00
California	
Los Angeles Ry.........................	11.08
San Diego Elec. Ry.....................	45.93
S ockton Elec. R.R.....................	1.60
Colorado	
I enver Tramway........................	17.83
Connecticut	
Connecticut Co.........................	99.08
Delaware	
I elaware Elec. Pwr. Co................	2.50
District of Columbia	
Capital Traction Co....................	1.38
Washington Ry. & Elec. Co..............	7.25
Florida	
Jacksonville Traction Co...............	9.77
Georgia	
Georgia Pwr. Co., (Athens).............	9.37
(Atlanta).............	1.92
Illinois	
C icago City Ry........................	1.25
C icago Rys............................	3.03
Il nois Pwr. & Lt. Corp. (Champaign).....	3.67
(Jacksonville)....	3.29
(Peoria)........	4.79
Jo iet, Plainfield & Aurora Transp. Co.......	38.00
Indiana	
E ansville, Suburban & Newburgh Ry.....	18.00
Shore Line Motor Coach Co..............	9.20
Iowa	
Des Moines Ry. Co......................	5.00
Fort Dodge, Des Moines & Southern R.R....	208.29
Iowa Southern Utilities Co.............	9.50
Sioux Transit Co.......................	2.30
Kentucky	
Kentucky Traction & Terminal Co.........	1,640.00
Kentucky Utilities Co..................	0.80
Louisville Ry..........................	9.78
Louisiana	
Louisiana Pwr. & Lt. Co.................	10.00
New Orleans Public Service, Inc..........	6.89
Maryland	
Delaware Elec. Pwr. Co..................	2.50
Potomac Edison Co.......................	410.80
United Rys. & Elec. Co..................	0.30
Massachusetts	
Berkshire St. Ry........................	72.50
Boston Elevated Ry......................	54.24
Eastern Massachusetts St. Ry............	70.42
Fitchburg & Leominster St. Ry...........	10.00
Gardner Templeton St. Ry................	4.50
Interstate St. Ry.......................	11.70
Massachusetts Northeastern St. Ry........	57.00
Middlesex & Boston St. Ry...............	5.27
Springfield St. Ry......................	28.45
Worcester Consolidated St. Ry...........	27.60
Michigan	
City of Detroit, Dept. of St. Rys...........	6.47
Eastern Michigan Rys....................	137.00
Missouri	
St. Louis Public Service Co..............	5.70
New Jersey	
Atlantic City & Shore R.R................	7.30
Coast Cities Ry.........................	10.00
Public Service Co-ordinated Transport....	912.16
Trenton Transit Co......................	4.50
New York	
Jamaica Central Rys.....................	3.15
Jamestown St. Ry........................	2.90
Kingston Consolidated R.R...............	3.72
Schenectady Ry..........................	5.25
North Dakota	
Durham Public Service Co................	8.98
Grand Forks St. Ry......................	1.00
Ohio	
Cincinnati & Lake Erie R.R..............	218.00
Cincinnati St. Ry.......................	4 10
Cleveland Ry............................	4.29
Community Traction Co...................	32.49
Dayton & Troy Elec. Ry..................	8.50
Wheeling Traction Co....................	8.08
Youngstown Municipal Ry.................	1.60
Pennsylvania	
East Penn Traction Co....................	17.60
Erie Rys.................................	8.10
Lackawanna & Wyoming Valley R.R.......	5.00
North Branch Bus Co.....................	20.00
Philadelphia Rapid Transit Co...........	8.00
Pittsburgh Rys..........................	34.86
Reading Transit Co......................	25.68
Schuylkill Transp. Co...................	37.80
Scranton Ry.............................	1.65
West Penn Rys...........................	92.00
Rhode Island	
United Elec. Rys. (Providence)...........	29.09
South Dakota	
Sioux Transit Co........................	2.30
Texas	
Dallas Ry. & Terminal Co................	5.90
Eastern Texas Elec. Co..................	20.41
El Paso Elec. Co........................	14.80
Houston Elec. Co........................	7.20
Northern Texas Traction Co..............	9.13
San Antonio Public Service..............	1.54
Utah	
Utah Lt. & Traction Co..................	1.74
Virginia	
Virginia Public Service Co..............	2.41
Washington	
Seattle Municipal St. Ry................	5.20
Willapa Elec. Co........................	6.23
West Virginia	
Monongahela West Penn Public Service Co..	46.80
Wisconsin	
Milwaukee Elec. Ry. & Lt. Co............	457.80
Mississippi Valley Public Service........	2.61
Wisconsin Pwr. & Lt. Co..	391.20
Wisconsin Public Service Co.............	0.45
Canada	
British Columbia Elec. Ry...............	10.77
Levis Tramways..........................	17.00
London St. Ry...........................	7.00
Montreal Tramways.......................	3.52
Sherbrooke Ry. & Pwr. Co................	29.00
Three Rivers Traction Co................	3.25
Winnipeg Elec. Co.......................	0.48

From Street Railway Thinking *to*

By

G. J. MacMURRAY

News Editor
Electric Railway Journal

WELL, it's all a matter of relativity, as Professor Einstein would say. The case of the electric railways, long a sick sister of industry, is something like that of the old lady who sent for her niece and said: "Grace, I'm going to die. I want to be laid out in my black silk dress, but take out the back panel and make yourself something from it." But Grace didn't like the idea. After some hesitation she said: "Oh! Aunt Mary, I don't want to do that. When you and Uncle Charlie walk up the golden stairs I don't want people to see you without any back in your dress." "They won't look at me," the old lady replied. "I buried your Uncle Charlie without his pants." With the coppers, the oils, the sugars, the pulp industry, the textiles, all in the doldrums, the troubles of the electric railways are attracting far less attention than they did a while ago.

We are still doing a good cash-and-carry business, with gross down only about an average of 7 per cent. The recent showing has not been quite so good as that made by the electric railways during the business depression of 1921 when the decrease in traffic was only about 5 per cent, but the results are fairly satisfactory under existing circumstances. To some extent, the railways were able to offset the decrease in traffic by economies in operation, but not sufficiently to preserve net revenue at the 1929 level, despite a slight increase in the average fare.

Statistically the average fare, as calculated by E. J. Murphy, chief statistician A.E.R.A., has risen from 8.44 cents in January to 8.48 cents in the middle of the year, while at the end of the year the figure was 8.55 cents. That is said for such solace as it may give. Fares range from the 2-cent zone in Cleveland to the flat 10-cent rate, with intermediate steps as numerous as Heinz' 57 varieties. But it has been discovered that the high flat fare is not always the answer. Legally, the most far-reaching fare decision was that in the Baltimore case in which the allowable return was fixed at 7½ to 8 per cent, with its incidental ruling on the need to permit depreciation to be set up on the basis of present values.

Nothing Is Constant But Change

Of course, the road to fortune is rough. Even the film star had first to learn to talk for the talkies and then to blush for the color films. First, last and always the same thing won't do. As the French say: "Nothing is constant but change." Too long the railways were like the professor who, in reply to the admonition of his wife to the effect that he did not look so well-dressed as he used to, replied: "That's strange, for they are the same clothes." Many of us in the railway industry try to get too much service out of the same clothes. We have been self-satisfied too long. Pride alone butters no parsnips. If there is any road to fortune it lies through the car. There, design is everything. Under the auspices of the Presidents' Conference Committee a definite program has been undertaken to stimulate modernization. C. F. Hirshfeld will analyze present car design so as to develop plans for improvement. In this work the car builders will co-operate. Also a committee has been appointed which is to deal with the matter of financing the purchase of new cars.

The committee on noise reduction of the A.E.R.A. has shown conclusively that much of the noise usually associated with car operation is avoidable. The new cars are much less noisy than those of the older type. In the latest type cars, aluminum and steel alloys are playing a larger part in body construction. All in all, the doctrine seems to be seeping in that engineers should pride themselves on their skill in designing to accomplish a definite purpose, rather than in the creation of monuments for posterity. In other words, as Wickwire said at the New England meeting last March, it doesn't seem sufficient to keep on improving the old designs—it looks as though we must design the new.

Continued acceptance of the bus as a tool of transportation is increasingly evident. Statistically, the big order of the year was by Public Service Co-ordinated Transport, Newark, for 381 new buses. In the matter of substitution, the one which has attracted most attention is the proposal of the New York Railways to replace cars with buses if, and when, the Board of Estimate grants

Transportation Ideas

the pending application of the New York City Omnibus Corporation. This proposal, however, implies no general change of the kind for New York City. Fundamentally, the problem is the same with the bus as it is with the car; namely, obtaining attractive appearance with simplicity and utility in design. A survey of urban de luxe operation made recently by the JOURNAL showed that the de luxe bus, operated at a special fare, attracts new riders, but not at the expense of the street car and the city type bus.

Almost every week there has come to hand some item of news confirming the growing interest in the trolley bus. To be precise, no less than six electric railways have installed, or ordered, some of these vehicles within the past ten months. Chicago leads with 89 vehicles Since the news of the Chicago installation broke early in the year, the Municipal Railway at Detroit has put a 5.63-mile line in operation, the Tennessee Public Service Company has installed a similar line, the Rockford Electric Company has inaugurated a 5.70-mile system, the New Orleans Public Service has announced additions to its fleet of trolley buses, and the Brooklyn & Queens Transit Corporation has installed an experimental line in Flatbush with the prospects of others to come. The Seattle Municipal Railway sent representatives to Chicago, Detroit and Salt Lake City to study these installations. About 167 trolley buses are now in service with prospects for the early installation of 140 more.

In the taxicab field greater and greater expansion by the electric railways is noted. In Kansas City, the Kansas City Public Service assumed control of the Yellow Cab Company last February. In New Jersey, Public Service Co-ordinated Transport acquired control of the Yellow Cab Company operating more than 400 cabs in Newark and vicinity. Previously it had entered the cab

The pageant of transportation progress shows many changes as the years go by field in Camden. In Rhode Island chaotic taxi conditions resulted in the cabs being brought under Public Service Commission jurisdiction just as had previously been done in Connecticut. Subsequently, the United Electric Railways, Providence, took over the bulk of the cabs there. In New York, the Mayor's commission has reported in favor of taxi regulation. Similar regulation is urged in Indianapolis. In Seattle, the taxi was brought under regulation, but the operators have sued to prevent enforcement of the new ordinance.

Approximately 2,500 taxicabs are operated under electric railway auspices, out of a total of 65,000 in the group of 189 large cities covered by a recent survey.

"The Three Inch Stream Through the Half-Inch Nozzle"

No matter how good the vehicle, how effectively it is advertised, we do not want to continue to engage, as Professor Daniels put it, in the almost hopeless task of trying to force a 3-in. stream through a half-inch nozzle. In other words, as Managing Director Gordon said in his speech at St. Louis, American cities are not making the best and most economical use of their streets. While they are widening streets and creating express boulevards at great expense, they are neglecting comparatively inexpensive improvements that would greatly speed up the movement of street cars. City officials have been thinking in terms of vehicles rather than in terms of people. The necessity for better control of unorganized transportation as represented by the motorists was the dominant theme of the National Safety Council meeting in Pittsburgh in October. As R. N. Watt, assistant to the president of the Montreal Tramways, said, the police department and the railway should be real partners in working out common problems, as they are mutually responsible for speedy transportation of citizens. To this the Royal Automobile Club of Canada replied that, while it stands primarily for the rights of motorists, it recognizes tram passengers comprise most of the persons who use transportation in the streets. Assistant Traffic Engineer Taylor, of the department of public works in Massachusetts, said it was the primary function of police traffic officers to promote safe, orderly and expeditious use of the streets. To do this best the problem should be approached from the standpoint of transportation rather than from that of law enforcement. Another helpful sign was the organization of the Traffic Institute.

Tending toward further alleviation of the traffic problems were such events as the stringent parking regulations adoped in Akron, the 10-cent parking lots established by the Detroit Municipal Railway, in the rerouting of eighteen street car lines in downtown Brooklyn, similar rerouting of bus and trolley lines in Omaha, the installation of flexible, progressive signal systems in Pittsburgh and elsewhere, which systems speed traffic and reduce accidents. Helpful to the movement of traffic in Philadelphia was the court decision upholding the right of the police to tow away cars that violate the parking ordinance. Several instances are recorded in which business interests instructed their drivers to park clear of tracks, to give the street car the right of way at intersections, and to avoid, as far as possible, operating over streets in which there are street car tracks. Merchants also are beginning to recognize that they have been misguided about the value to them of customers who come to them in their own automobiles. In this connection, it is interesting to note that parking golf while, not a new amusement, has spread until it is now played in nearly every city in the United States. According to the *American Motorist,* all that one needs to indulge in this game are an automobile, a city street, a tank full of gasoline, and plenty of time, the last being particularly important. As *Two Bells,* the clever little publication of the Georgia Power Company, put it:

When Noah sailed the waters blue,
He had his troubles, same as you;
For forty days he drove the ark
Before he found a place to park.

That congestion is a problem of first magnitude is attested by the estimate of $2,000,000,000 a year as the cost in the United States of the economic waste due to traffic delays.

History should, of course, be considered as something more than running comment on the gallery of feature stories. My problem is akin in some respects to that of Mark Sullivan, who tried to organize such topics as Teddy Roosevelt's teeth, your mother's bustle, Fred Merkle's failure to touch second base, Dr. Stiles' hookworm campaign, Senator La Follette's career, and Thomas Fortune Ryan's purchase of the Equitable Life Insurance Company. Not that I have forgotten the title of the story. Far from it. "From Street Railway Thinking to Transportation Ideas," a phrase used by Cap Williams and others, is, however, best emphasized by the record showing the extent to which the idea of merchandising the service has spread. Consider the Cincinnati Street Railway's idea of creating a "street car estate" applicable, for instance, to life insurance through savings made by patronizing the street cars, San Diego's scientific customer study, Edward Dana's ten radio broadcasts, the North and the South Shore Lines "Around the World in Chicago Tours," the Interstate Public Service Company's cut in suburban fares, Roanoke's use of a circulating sales manager to sell transportation, the Baltimore, San Francisco and other advertising campaigns. Why, Baltimore is even permitting smoking on its new cars. At Lexington, Ky., the railway lowered fares to stimulate local buying.

Nearly everywhere the recognition has grown that it is essential to speed up service. Trailers have been dropped in Chicago and, to some extent, in Cleveland. To this end equipment and maintenance men are bettering their processes. The idea that increased speed is essential was perhaps put best by W. T. Rossell in his notable contribution to the Convention Issue of the Journal. Recognition has also been growing that higher accelerating and braking rates bring faster schedules. The shop man in his overalls is a salesman of transportation just as much as is the operator in his brass-buttoned uniform.

In El Paso an interesting experiment was conducted in house-to-house selling of street car rides. Not only the city companies, but the interurbans have been alive to merchandising needs. In Indiana, a new service was started for users of the electric railway freight facilities whereby all or a portion of the expense to and from local freight houses was assumed by the railways. Binghamton conducted a successful poster competition. At Cincinnati, a novel merchandising plan was devised under which the Cincinnati Street Railway co-operated with the motion picture industry.

Among other contributions of merchandising ideas were the discussions by Charles Gordon on improvement in the ride, by H. S. Williams, assistant superintendent of equipment, Detroit Municipal Railways, on lowering costs and bettering public relations by reducing noise, and that by H. A. Otis, engineer of car equipment of the

Pungent Portrayals in Pen and Pencil

PATIENTLY WAITING FOR THE CEREMONY

'Ware the Avalanche of Deficit Hill!

TAX PAYERS
V
BRONSTRUP IN SAN FRANCISCO CHRONICLE

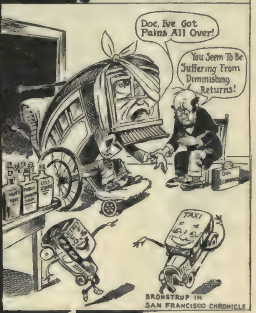
The Age of Speed

IN YE GOOD OLD DAYS YOU COULD TRAVEL 8 MILES IN AN HOUR
TODAY YOU CAN COVER THE SAME DISTANCE IN ABOUT 12 MINUTES
AND SPEND THE REST OF THE HOUR LOOKING FOR PARKING SPACE
HERBLOCK IN CHICAGO DAILY NEWS

Once Overs By C. D. Batchelor

"Your Honor, has the Noise Abatement Commission reported yet?"
"Yes, but other commissions were making so much noise I couldn't hear its report."

When Patent Medicine Fails, Call the Doctor


Doc, Ive Got Pains All Over!
You Seem To Be Suffering From Diminishing Returns!
HIGHER FARE
PUBLIC OWNERSHIP
LESS SERVICE
DOC ECONOMIC
TAXI
BRONSTRUP IN SAN FRANCISCO CHRONICLE

WONDERFUL IF TRUE

"Don't Forget, You Pick Up Both of Them"

RIDE, MISTER?
DAMAGE SUIT FOR PERSONAL INJURIES IN CASE OF ACCIDENT
Memphis Commercial Appeal

Once Overs By C. D. Batchelor

Snapshooting the Millennium.
"Madam, we are happy to welcome you as a patroness of our service. Just take your time, we are but your humble servants."

Chicago Rapid Transit Company, in which he discussed the need for meeting the passenger demand for greater comfort and convenience. More business and how to get it was the theme of the annual meeting of the C.E.R.A. held in Cleveland. As Jim Welsh recently said, street railways must adapt themselves to a new psychology if they are to compete successfully with other highly efficient forms of transportation and survive. His were indeed words of wisdom: "Before the competitive era, the problem of the street railway management was to supply a service that would satisfy the clientele forever clamoring for more cars. Under present-day competitive conditions, these same managements have had to learn to sell, whereas before they tried only to serve. Once the problem was to find sufficient cars to carry the people; today the problem is to find the people to fill the cars."

HARDLY "FARE" TO THE CONDUCTORS

IF A WEEKLY COUPON PERMIT IS ISSUED TO THE FATHER OF THREE CHILDREN ONE OF WHOM TRAVELS BETWEEN 9.39 AND NOON, WHEN WILL THE ONE-MAN CAR SYSTEM BE ABOLISHED?
STREET CAR EMPLOYEE
Arch Dale in Free Press Evening Bulletin, Winnipeg

Where selling is concerned, you must not be too scientific. You can't afford to let the efficiency idea get you the way it did one of Henry Ford's employees. The employee dreamed that Henry died. He saw the black casket being borne by six of Henry's oldest and most faithful employees. As the casket came by, Henry raised up, looked around, and offered the following suggestion: "If you put rollers under this casket, you could lay off five men."

Also bearing out the title, 'From Street Railway Thinking to Transportation Ideas," is the record of the topics under discussion at association meetings. This list of topics is, indeed, wide in scope. The San Francisco meeting was notable for the intensity of the discussion, and was particularly praiseworthy because of the opportunity afforded to the delegates to study the operation of properties on the Pacific Coast. Out of the convention there emerged the very definite feeling that the path of progress for the industry lies in the direction of scientific study of its problems. The New England Street Railway Club triumphed at its February meeting in securing as a speaker Winthrop More Daniels, professor of transportation at Yale University. So well did he emphasize the need for giving the electric railways preferential use of the streets, particularly during the rush hours, that a wit remarked that street railway track appears to be a place for street cars when no one else wants it. At Providence, Secretary Hecker outlined the industry's problems.

The Canadians—who incidentally have increased revenues more than 100 per cent during the last fifteen years—also held a most successful annual convention at Ottawa in October. Again the trolley bus and the matter of fare structure were among the matters discussed. Similarly, the trolley bus and the need for higher acceleration were topics before the Illinois Association in March. Merchandising and the competitive nature of the electric railway business was stressed at the Oklahoma meeting last spring. The sectional meetings of the equipment men, notably the meetings of the Southerners, were concerned with the analysis of maintenance practices. J. H. Hanna, now president of the American Association, spoke authoritatively about the problems of the industry before the West Virginia Association. At the first meeting of the new A.E.R.A. executive committee it was made clear that the plans of the association are being carried forward militantly, and that the association's financial affairs are in good shape. Showing that it, too, is ready to take advantage of new modes of transportation, Electric Railway Journal shipped to San Francisco by airplane copies of Railway Journal News containing a review of convention activities and the news of the week, so that copies could be distributed as the delegates went into session on Monday morning.

It was at the San Francisco convention that announcement was made that the Youngstown Municipal Railway had been returned the winner of the Coffin Award. The United Electric Railways, Providence, won the Class A *Bus Transportation* Maintenance Award, with the Community Traction Company, Toledo, coming in second. Blue Ridge Transportation Company was first in the Class B award in this contest, with the Washington Rapid Transit Company second, and Groton & Stonington Company first in the Class C award. This year the Brady safety medals were won by the Duluth, Colorado Springs and the Lethbridge Street Railways. In Electric Railway Journal's own maintenance awards contest, the company trophy, the individual cash prize, and two certificates of merit went to the Cleveland Railway, while the Ottawa Electric Railway won in the department of rolling stock and shops.

Co-ordination of various services during the year has been pronounced. Among the companies to bring together cars, buses, and taxis was the Cincinnati Street Railway. In St. Louis the idea of co-ordination is still being agitated, one plan being to include express bus service to supplement street cars on heavily traveled lines, replacement of street cars by buses on lines that are not self-sustaining, and the installation of de luxe bus service at higher fares between downtown districts and the residential section. Co-ordination is, of course, the principal idea behind the new Chicago franchise. Improvements are under way there to the elevated and the surface lines and the construction of the first section of a subway downtown has been authorized. Meanwhile, the financial set-up of the new company, intricate in detail, is being arranged.

In Cleveland, the *Plain Dealer* commended the Cleveland Railway, saying that the company's plan to embrace the whole county in a single transportation system would encourage Cuyahogans outside of the present city to think in terms of metropolitan development. In the comment in the daily press in Cleveland, Boston, Philadelphia, Chicago, and other cities, there has been reflected growing recognition of the value of unification and co-ordination of the transportation facilities. As the Nashville *Tennessean* said: "The cities that have grown and developed most rapidly in recent years have, as a general rule, been those that have been awake to the importance of transportation." Co-ordination again appears to be in prospect in New York City. In Philadelphia, the price recently fixed for the purchase of the property of the P.R.T. by the city is less than that which the company had maintained would be equitable. Detroit's public is well pleased with express street car service. There fewer stops and higher speeds facilitate the movement of all traffic.

COUNTED OUT

Brooklyn Daily Eagle

The big franchise news of the year was the passage on July 1 by the voters of the new franchise designed to bring about co-ordination in Chicago. Phases of this proceeding are aptly illustrated by the accompanying cartoons from the Chicago *Daily News*. The wedding of the companies has not yet actually occurred, but it seems likely the ceremony will be performed soon. The San Francisco franchise extension vote also was pleasing, as was the mandate to the legislature of Massachusetts by metropolitan Boston to extend the public control act ten years. Portland, Ore., may segregate its railway lines under the new service-at-cost grant, but progress there has been retarded. That Toledo will renew its service-at-cost ordinance, slightly modified, seems likely. In Springfield, Ohio, franchise affairs appear to be headed n the right direction. That is true also of the Jacksonville negotiation. Niagara Falls decided to liberalize n terms of its franchise upon assurance from the International Railway that service would be improved ma-erially. On the other hand, Chicago's lake front towns seem to have reached an impasse because one of them would not meet conditions accepted by the others which are regarded by the Chicago, Whiting & Hammond Railway as essential to successful rehabilitation.

In Indianapolis, franchise terms are now a matter of negotiations, $9,000,000 in improvements being at stake here under guarantees from the Insulls, who proposed to reorganize the property. In Akron the temporary franchise under which operating costs are being determined has been extended for nineteen months. Indirectly, of course, the matter of franchise terms and what they imply are at stake in the Columbia, S. C., case, passed upon by the Supreme Court. Incidentally, Justice Ingraham, of the New York Supreme Court, ruled last February that the present contract between the Interborough and the City of New York covering the operations of rapid transit lines makes the 5-cent fare binding.

More general acceptance is noted of the idea that providing rapid transit is the city's responsibility. Pittsburgh is flirting with the subway idea again. As for New Orleans, Bartholomew & Company sees no need for rapid transit there now. Philadelphia has before it the Chestnut Street and the Delaware River Bridge rapid transit projects. However, New York, Boston, Philadelphia and Chicago remain the only cities in which regular high-speed subway and elevated service is given. Suburban electrification went on apace at Cleveland, Philadelphia and New York,

TRANSPORTATION IN ALL ITS PHASES

The men who run the local transportation system are good eggs at heart, but it doesn't help public relations if they look as if their blood had turned to vinegar and they had just breakfasted on green persimmons. Their job is transportation—in all its phases, railway, bus, taxi, trolley bus. That's their work. There's nothing dual about it. They don't have to stop and ask themselves about it as did the radio entertainer who at the crucial moment could not remember whether he was an A. & P. Gypsy, a Michelin May, a Flit Soldier or a Cliquot Club Eskimo.

In days of yore if anybody missed a stage coach he was content to wait for two or three days for the next one. Now he lets out a squawk if he misses one section of a revolving door. The railway man must constantly remember that. It's fine to be a railway man, but don't forget the case of the Englishman who, at a political meeting, orated that he had been born an Englishman, had lived an Englishman and hoped he would die an Englishman, only to have a Scotchman yell from the back of the hall in unmistakable accent: "Man, hae ye no ambeetion." For the railway man his ambition is well expressed in the phrase: "From Street Railway Thinking to Transportation Ideas."

Rolling Stock Purchases Continue at Moderate Rate

Although unfavorable business conditions prevailed during the past year, the electric railways bought more than 600 new cars for city and interurban service. Numerous orders placed for heavy traction equipment. Many obsolete cars retired

By
J. W. McCLOY
Assistant Editor
Electric Railway Journal

Summary of Car Purchases

	United States	Canada	Total
Number of companies reporting purchase of new cars..........	33	2	35
CITY SERVICE			
Passenger motor cars single truck......................	12	..	12
Passenger motor cars double truck......................	545	5	550
Service......................	1	1	2
Total cars for city service.....	558	6	564
INTERURBAN SERVICE			
Passenger motor cars..........	47	..	47
Express and freight cars.......	11	..	11
Miscellaneous cars............	5	..	5
Total cars for interurban service........................	63	..	63
MULTIPLE-UNIT SUBURBAN CARS...................	*407	..	*407
ELECTRIC LOCOMOTIVES...	24	..	24
Grand total..................	1,052	6	1,058

*Includes 258 cars previously used in steam service converted for electric operation.

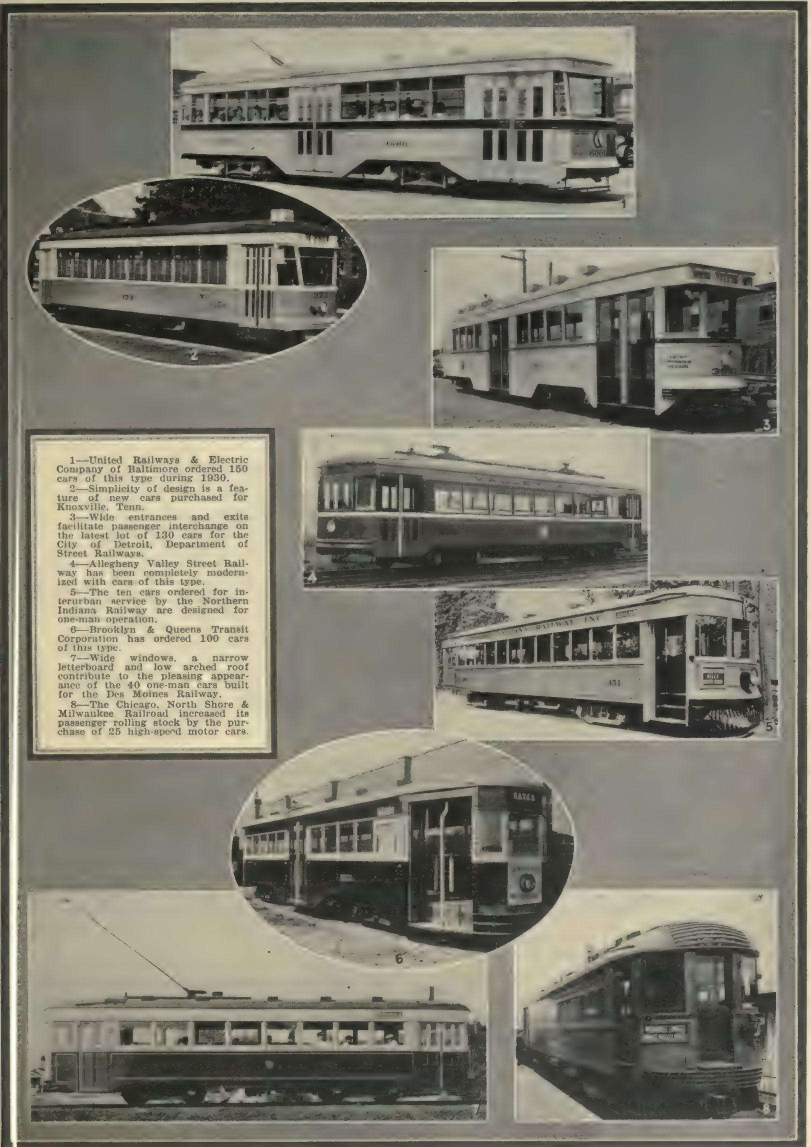
MORE than 1,000 rolling stock units of various kinds were added to the equipment of the electric railways and the electrified railroads during the past year, despite the curtailment of improvement programs necessitated by the business depression. This figure is less than that for 1929 when 1,496 were added, but larger than that for 1928, when the number was only 897. Of the total for 1930, approximately 800 were new cars and locomotives, while some 250 were cars formerly used in steam service which were converted for electric operation. Orders for double-truck motor passenger cars for city service totaled about 550. Twelve single-truck cars were bought. For interurban service 47 new passenger motor cars were ordered, together with some freight and miscellaneous cars. New multiple-unit cars for electrified suburban service numbered about 150. Orders were placed for 24 electric locomotives. The list of purchasers included 33 companies in the United States and two in Canada.

Three street railway companies placed orders for 100 cars or more apiece. The largest single order was that of the United Railways & Electric Company, of Baltimore, for 150 cars of all-steel construction, of the front-entrance, center-exit type, seating 55 passengers and weighing 39,000 lb. One hundred of the cars were built by the J. G. Brill Company, while the Cincinnati Car Corporation built 50. The cars are so designed as to be available for one-man operation. They are mounted on Brill 177-E-1 trucks, with 5-ft. 6-in. wheelbase and 26-in. steel wheels.

The Department of Street Railways, City of Detroit, continued its equipment improvement program with the purchase of 130 cars from the St. Louis Car Company. This property purchased 101 cars in 1929, and 100 in 1928. The new cars are of semi-steel construction, and are of the single-end, front-entrance, center-exit type, designed for two-man operation. They seat 52 passengers, and weigh approximately 37,000 lb. each.

Another large order was that of the Brooklyn & Queens Transit Corporation, which recently duplicated its 1929 order for 100 cars for city service. Fifty of the new cars will be built by the J. G. Brill Company, and 50 by the Osgood-Bradley Car Company. They will be of the front-entrance, center-exit type, seating 54 passengers, and will weigh about 37,000 lb. An interesting feature is a turnstile arrangement for fare collection. These cars will be suitable for one-man operation if desired.

The Des Moines street railway purchased 40 double-truck cars for city service from the Cummings Car & Coach Company. These units, which seat 51 passengers, are designed for one-man, single-end operation. Market Street Railway, of San Francisco, built 21 double-truck city passenger cars in its own shops. Oklahoma Railway, of Oklahoma City, ordered twenty double-truck cars for city service from the St. Louis Car Company. They are designed for one-man operation, seat 32 passengers, and weigh 25,740 lb. Fifteen double-truck city passenger cars were built by the St. Louis Car Company, for the Pacific Electric Railway, of Los Angeles. Seating capacity is provided for 40 passengers. The weight is 37,000 lb. Ten cars for city service were delivered to



1—United Railways & Electric Company of Baltimore ordered 150 cars of this type during 1930.

2—Simplicity of design is a feature of new cars purchased for Knoxville, Tenn.

3—Wide entrances and exits facilitate passenger interchange on the latest lot of 130 cars for the City of Detroit, Department of Street Railways.

4—Allegheny Valley Street Railway has been completely modernized with cars of this type.

5—The ten cars ordered for interurban service by the Northern Indiana Railway are designed for one-man operation.

6—Brooklyn & Queens Transit Corporation has ordered 100 cars of this type.

7—Wide windows, a narrow letterboard and low arched roof contribute to the pleasing appearance of the 40 one-man cars built for the Des Moines Railway.

8—The Chicago, North Shore & Milwaukee Railroad increased its passenger rolling stock by the purchase of 25 high-speed motor cars.

Rolling Stock Ordered During 1930

Name of Company	No.	Type of Vehicle	Single or Double Truck	Total Weight, Lb.	Seating Capacity	Length Over All Ft.—In.	Motors	Wheel Diameter, Inches	One-Man or Two-Man
Alabama									
Mobile Lt. & R.R. Co.	7	City passenger	Single	19,000	33	29—9	Two, 25 hp.	26	1-man
California									
Los Angeles Ry.	2	City passenger	Double	38,000	55	49—0	Four, 50 hp.	26	2-man
Market St. Ry.	21	City passenger	Double	39,000	52	47—0	Four, 40 hp.		2-man
Northwestern Pacific R.R.	7	Interurban pass.	Double	110,000	98	72 10	Four, 140 hp.	36	2-man
	2	Interurban pass.	Double	79,200	103	72 10	Two, 140 hp.	33	
Pacific Electric Ry.	15	City passenger	Double	37,000	40	38—2	Four, 35 hp.	26	
Sacramento Northern Ry.	1	Elec. locomotive							
Connecticut									
New York, New Haven & Hartford R.R.	12	M.U. suburban mtr			120				
	19	M.U. suburban trail			120				
	2	M.U. comb. pass. and baggage			87				
	*19	M.U. suburban							
	10	Elec. locomotives							
Delaware									
Delaware Elec. Pwr. Co.	12	City passenger	Double	36,640	44	41—10	Four, 35 hp.	26	1-man, 2-man
	1	Service							
Illinois									
Chicago, North Shore & Milwaukee R.R.	25	Interurban pass.	Double	102,000	48		Four, 140 hp.		2-man
Chicago & Joliet Elec. Ry.	1	City passenger	Single	17,500	40	36—0	Two, 50 hp.	22	1-man
Illinois Terminal R.R.	1	Elec. locomotive		190,000			Four, 250 hp.		
Indiana									
Chicago, South Shore & South Bend R.R.	4	Elec. locomotive		160,000					
	3	Service							
Northern Indiana Ry.	10	Interurban pass.	Double	42,000	50	47—2	Four, 50 hp.	28	1-man
	10	City passenger	Double	31,000	44	42 4	Four, 35 hp.	26	1-man
Iowa									
Des Moines Ry.	40	City passenger	Double	35,300	51	42—0	Four, 40 hp.	26	1-man
Kansas									
Arkansas Valley Interurban Ry.	2	Refrigerator					None		
Louisiana									
Monroe Municipal Ry.	4	City passenger	Single	16,000	32	28—0	Two, 25 hp.	26	1-man
Maryland									
United Rys. & Elec. Co. of Baltimore	150	City passenger	Double	39,000	52	46—0	Four, 50 hp.	26	1-man
Michigan									
Dept. of St. Rys., Detroit	130	City passenger	Double	37,000	52	48—5	Four, 35 hp.	26	2-man
Eastern Michigan Rys.	10	Freight					None		
New Jersey									
Delaware, Lackawanna & Western R.R.	*141	M.U. suburban pass.					None		
Public Service Co-ord. Transport	†3	Interurban pass.	Double	40,000	32	50—0	Two		
New York									
Brooklyn & Queens Transit Corp.	100	City passenger	Double	37,000	54	45—6	Four, 35 hp.	26	1-man
Long Island R.R.	45	M.U. suburban pass.	Double	119,000	72	63—11	Two, 225 hp.	36	
	*40	M.U. suburban pass.	Double	80,600	78	64—6	Two, 225 hp.	36	
Ohio									
Lake Shore Elec. Ry.	1	Freight					None		
Oklahoma									
Oklahoma Ry.	20	City passenger	Double	25,740	32	37—5	Four, 25 hp.	26	1-man
	1	Elec. locomotive							
Pennsylvania									
Allegheny Valley St. Ry.	12	City passenger	Double	32,100	48	47—3	Four, 35 hp.	22	1-man
Lehigh Valley Transit Co.	10	City passenger	Double	37,320	48	45—10	Four, 35 hp.	26	2-man
Pennsylvania R.R.	*58	M.U. suburban pass	Double	128,000	72	64—6	Two, 252 hp.	36	
	2	Elec. pass. loco.		300,000			‡		
	2	Elec. pass. loco.		375,000			§		
	2	Elec. freight loco.		330,000			Four, 625 hp.		
	*1	Service	Double	130,000		64—6	Two, 225 hp.	36	
Reading Co.	70	M.U. suburban pass		128,000	84	72—11½	Two, 275 hp.	38	
York Rys.	3	City passenger	Double	33,600	50	43—3	Four, 25 hp.	26	1-man
Tennessee									
Knoxville Pwr. & Lt. Co.	10	City passenger	Double	33,200	44	39—4	Four, 35 hp.	26	1-man
Utah									
Salt Lake & Utah R.R.	1	Elec. locomotive		120,000					
Wisconsin									
Milwaukee Elec. Ry. & Lt. Co.	10	Articulated units	Double	68,000	122	43—0	Six 50 hp.	26	
Dominion of Canada									
Edmonton Radial Ry.	5	City passenger	Double	38,675	51	46—0	Four, 40 hp.	26	1-man
Regina Municipal Ry.	1	Snow sweeper		50,000					

*Converted from steam to electric. †Gas electric. ‡Two twin motors, 1,250 hp. each. §Three twin motors, 1,250 hp. each.

the Knoxville Power & Light Company by the Perley A. Thomas Car Works, Inc. Northern Indiana Railway, of South Bend, received ten one-man double-truck passenger cars for city service from the Cincinnati Car Corporation.

Twelve single-truck passenger cars were purchased during the year, of which seven were ordered by the Mobile Light & Railroad, four by the Municipal Railway, of Monroe, La., and one experimental car by the Chicago & Joliet Electric Railway. Three of the Mobile cars, which seat 33 passengers and weigh 19,000 lb., were supplied by the Perley A. Thomas Company, the other four being built by the American Car Company of St. Louis, which also supplied the Monroe cars. All of these cars were designed for one-man operation.

The only order for articulated cars was that of the Milwaukee Electric Railway & Light Company, which purchased ten two-car units for suburban service from the St. Louis Car Company. The units, which weigh 68,000 lb. and seat 122 passengers, are provided with six

50-hp. motors, with four mounted on the forward car and two on the trailer.

The largest order for interurban passenger equipment was that of the Chicago, North Shore & Milwaukee Railroad for 25 cars from the Standard Steel Car Company. The Northwestern Pacific Railroad, a third rail system operating out of San Francisco, ordered seven motor cars and two trailers from the St. Louis Car Company. Body construction is of aluminum and steel, with arch roofs. Seating capacity of the motor cars is 98 and of the trail cars 103. They have an over-all length of 72 ft. 10½ in., and a width over the eaves of 10 ft. 6 in. The motor cars, which are equipped with Westinghouse No. 557-E motors of 140 hp. mounted on trucks supplied by the General Steel Castings Company, weigh complete 110,000 lb., while the weight of the trail cars is 79,200 lb.

Carrying out a rehabilitation program which had been decided upon following its financial reorganization, the Northern Indiana Railway, of South Bend, ordered ten interurban cars from the Cummings Car & Coach Company. They are designed for one-man operation, weigh 42,000 lb., and are equipped with four Westinghouse No. 516, 50-hp. motors, designed to give a maximum speed of 60 m.p.h. As previously stated, this company also received ten cars for city service from the Cincinnati Car Corporation.

In few of the cars ordered during the year was there any considerable departure from conventional design. Arch roofs predominate. Extensive use has been made of steel and aluminum in sheathing and framing. In the types intended for city service there was an evident effort to reduce the weight to a minimum without sacrificing stability. Of the double-truck cars for city service, the weight per seated passenger ranged from 670 lb., in the case of the cars for the York Railways, and for the Allegheny Valley Street Railway, to 850 lb. for the fifteen cars of the Pacific Electric Railway. The single-truck cars of the Monroe Municipal Railway, with a total weight of but 16,000 lb., averaged 500 lb. per seated passenger, while the cars ordered for the Mobile Light & Railway Company averaged about 576 lb. per seated passenger.

New Rolling Stock Ordered Since 1907

Year	Passenger Cars City	Passenger Cars Interurban	Electrified Suburban	Freight and Miscellaneous Cars	Electric Locomotives	Total
1907......	3,483	1,327	..	1,406	(a)	6,216
1908......	2,208	727	...	176	(a)	3,111
1909......	2,537	1,245	...	1,175	(a)	4,957
1910......	3,571	990	. .	820	(a)	5,381
1911......	2,884	626	...	505	(a)	4,015
1912......	4,531	783	..	687	(a)	6,001
1913......	3,820	547	. .	1,147	(a)	5,514
1914......	2,147	384	..	479	(a)	3,010
1915......	2,072	336	..	374	(a)	2,782
1916......	3,046	374	...	491	31	3,942
1917......	1,998	185	...	223	49	2,455
1918......	1,842	255	..	278	44	2,419
1919......	2,129	128	...	172	18	2,447
1920......	2,889	227	..	465	17	3,598
1921......	1,059	129	...	81	7	1,276
1922......	2,910	187	..	405	34	3,536
1923......	2,915	427	. .	595	92	4,029
1924......	1,985	538	...	1,538	31	4,092
1925......	1,054	320	...	238	47	1,659
1926......	1,249	309	...	264	60	1,882
1927......	824	121	.	363	40	1,348
1928......	601	93	..	171	32	897
1929......	963	79	240	137	77	1,496
1930......	562	47	407	18	24	1,058

(a) Included in "Freight and Miscellaneous Cars."

Number of Cars Owned by Electric Railways by Years

		Passenger Motor	Passenger Trailer	Freight Motor	Freight Trailer	Locomotives	Service	Others	All Cars
1 20	United States.	77,722	6,027	1,215	7,441	751	5,723	6,809	105,688
	Canada......	4,269	136	133	612	53	53	714	5,970
	Total........	81,991	6,163	1,348	8,053	804	5,776	7,523	111,658
1 21	United States.	77,921	6,142	1,324	7,712	760	7,005	4,754	105,618
	Canada......	4,348	138	134	538	54	67	717	5,996
	Total........	82,269	6,240	1,458	8,250	814	7,072	5,471	111,614
1 22	United States.	75,442	7,624	1,375	7,903	772	8,761	2,795	104,672
	Canada......	4,413	312	143	575	56	168	531	6,198
	Total........	79,855	7,936	1,518	8,478	828	8,929	3,326	110,870
1 23	United States.	75,249	7,423	1,712	8,442	814	8,971	2,435	105,046
	Canada......	4,262	365	134	646	62	213	448	6,130
	Total........	79,511	7,785	1,846	9,088	876	9,184	2,883	111,176
1 24	United States.	75,678	6,768	1,790	9,016	799	9,092	2,491	105,634
	Canada......	4,267	364	136	642	62	212	442	6,125
	Total........	79,945	7,132	1,826	9,658	861	9,304	2,933	111,759
1 25	United States.	74,898	6,737	1,760	9,138	809	9,004	2,370	104,716
	Canada......	4,311	367	130	637	67	232	463	6,207
	Total........	79,209	7,104	1,890	9,775	876	9,236	2,833	110,023
1 26	United States.	73,694	7,050	1,960	9,850	870	8,731	2,600	104,755
	Canada......	3,945	368	125	629	67	313	380	5,827
	Total........	77,639	7,418	2,085	10,479	937	9,044	2,980	110,582
1 27	United States.	72,030	7,355	2,265	10,500	910	8,474	2,950	104,484
	Canada......	3,878	354	297	618	64	382	57	5,650
	Total........	75,908	7,709	2,562	11,118	974	8,856	3,007	110,134
1 28	United States.	69,963	7,660	2,488	11,037	948	8,208	3,286	103,590
	Canada......	3,706	364	249	472	62	419	51	5,323
	Total........	73,669	8,024	2,737	11,509	1,000	8,627	3,337	108,913
1 29	United States.	67,035	7,001	1,857	11,342	946	8,749	3,325	100,255
	Canada......	3,831	368	244	469	65	449	49	5,475
	Total........	70,866	7,369	2,101	11,811	1,011	9,198	3,374	105,730
1 30	United States.	65,370	6,878	1,487	10,900	995	8,503	3,000	97,133
	Canada......	3,792	376	225	437	61	431	40	5,362
	Total........	69,162	7,254	1,712	11,337	1,056	8,934	3,040	102,495

In the matter of lighting, seat spacing and seating material, the aim has been to provide the utmost for the comfort of the passenger. This feature is exemplified in the cars ordered by the United Railways & Electric Company, of Baltimore, which have full leather upholstery throughout, easy means of entrance and exit, and ample lighting facilities. Progress has been made in increasing the speed of acceleration and braking. The Baltimore cars, for instance, by means of PCM and VA control, are able to obtain a smooth acceleration of 3.25 m.p.h.p.s. while the brakes are designed to stop the car at the rate of 3.5 m.p.h.p.s., with a load equal to three quarters of the seating capacity. In the Brooklyn cars, acceleration is provided at the rate of 3 m.p.h.p.s. and deceleration at the rate of 2.5 m.p.h.p.s. Twenty-six inch wheels have predominated in orders for cars for strictly city service.

Designed to meet the requirements of a rather unusual situation, the new cars ordered by the Allegheny Valley Street Railway present several distinctive features. The route served is approximately 20 miles in length, and passes through a succession of small towns and villages, as a consequence of which the service is urban rather than interurban. The twelve cars ordered have leather upholstered reversible seats for 48 passengers, and weigh complete, 32,100 lb. Four 35-hp. motors with WN drive are geared to obtain a free running speed of 43.5 m.p.h. Through the utilization of 22-in. wheels, with a modified form of the Cincinnati Car Corporation's cantilever type truck, it has been possible to construct the car with only one step and without a ramp in the floor. The weight of the truck is 6,600 lb., which is said to be the lightest of any WN drive truck in operation.

Of the single-truck cars ordered, those for Mobile and for the Monroe Municipal Railway are equipped with two 25-hp. motors, while the experimental car for the Chicago & Joliet Electric Railway is provided with two motors of 50 hp. Four 25-hp. motors are provided on the double-truck cars ordered by the York Railways, while the cars ordered by the Pacific Electric Railway, the Delaware Electric Power Company, the Northern Indiana Railway, the Detroit Department of Street Railways, the Brooklyn & Queens Transit Corporation.

the Allegheny Valley Street Railway, the Lehigh Valley Traction Company, and the Knoxville Power & Light Company have motors of 35-hp. capacity.

Blackhall Car Has Many New Features

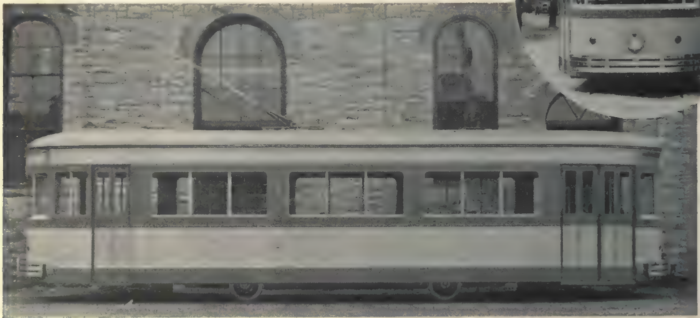
Of the cars ordered during the year, the one built at the Cummings Car & Coach Company plant under the supervision and from the designs of J. R. Blackhall, general manager Chicago, North Shore & Milwaukee Railroad, departs most from conventional practice. Experimental work and testing of the car were conducted during the past year on the system of the Chicago & Joliet Electric Railway.

Among the important features of this car are: (1) chassis, made up of two Timken semi-floating axles, with a centrally located worm gear on each; four 22-in. spun cast-steel wheels, two side frames designed as trusses with compression members underslung from the axles, and cross members at the frame ends which carry the springs on 18-ft. centers; (2) underframe, made entirely of heat-treated strong alloy aluminum extruded or rolled Carnegie sections and castings, and designed for supporting the two 50-hp. motors; body construction, with inside walls comprising the strength members, outside sheets removable with a screwdriver, window frames of extruded aluminum sections, ceiling of hard-rolled aluminum sheet carried around the vestibule in the form of an ellipsoid, ends of replaceable aluminum castings, and insulated walls; (3) dynamic braking and two alternative systems of friction braking, using brakeshoes on disks mounted on motor shafts, also connections to allow "plugging the motors" for severe braking; (4) hydraulic, instead of air, operation of brakes and doors, using a small gear pump, mounted on the worm housing of the axle and weighing only a few pounds; (5) use of 6,876 lb. of aluminum in the chassis and body, saving 12,324 lb. and making possible the low total weight of 17,500 lb.; (6) noise reduction, effected by stopping wheel resonance, inserting rubber pads between the axles and chassis frame, installing rubber shock insulators on the spring ends, insulating the floor, trolley base and motor supports, and eliminating air exhaust; (7) cadmium-plated bolts, nuts and screws, with National Fine (S. A. E.) threads; (8) pleasing exterior, enhanced by elliptical profile of roof, elimination of roof appurtenances except the trolley base, body lines carried around the entire car without a break, continuous skirt brought down to the step-well level; (9) ventilation with a motor-driven volume exhaust blower, removing the air through grills in the ceiling; and (10) heating by utilizing the rheostatic losses in accelerating and the dynamic braking energy during deceleration.

Public Service Co-ordinated Transport, of Newark, N. J., also developed during the year an unusual type of gas-electric rail car, of which three were built in the company's shops for service over a 50-mile route between New Brunswick and Trenton. The cars, which are intended for one-man operation, are of the double-end, double-truck type, 50 ft. in length, and weigh about 40,000 lb. The power plant, a unit job, consists of two Yellow Coach 150-hp. gasoline engines with generators. These are mounted amidship, each feeding two electric motors mounted on a special type of Brill truck, equipped with Timken worm drive. Wheels mounted on roller bearings are provided, instead of the conventional journals. De luxe seating accommodations are provided for 32 passengers.

Expansion of electrified steam railroad service is indicated by the addition of 424 units of equipment to the rolling stock of these lines. Of this total, 148 represented new multiple-unit passenger cars built for this service, while 258 were former steam railroad coaches, converted for electrical operation. Other additions included ten electric locomotives for the New York, New Haven & Hartford Railroad, six electric locomotives and one service car for the Pennsylvania Railroad, and one electric locomotive for the Salt Lake & Utah Railroad.

Electric railways cleaned house during the year to the extent of scrapping or otherwise disposing of some 2,776 pieces of equipment. Included in the list were 1,926 passenger motor cars, 82 passenger trail cars, 34 freight motor cars, 436 freight trail cars, 288 service cars, three miscellaneous cars and seven electric locomotives. In a number of instances the equipment simply changed hands, being sold by one property to another. This total of 2,776 units of rolling stock disposed of is somewhat more than the total figure for 1929, which was slightly over 2,300, but was more than for any other recent year for which records are available.



Experimental car being tried on Chicago & Joliet Electric Railway

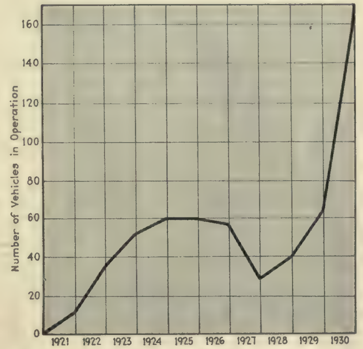
Trolley Bus Experiences Unprecedented Growth *During Past Year*

Five new installations add 105 vehicles and 34.90 route miles. With additions of 11 trolley buses and 7.36 route miles by systems already in operation totals for industry rise to 182 vehicles and 70.05 miles

By

CLIFFORD A. FAUST

Assistant Editor
Electric Railway Journal



Number of trolley buses in operation in the U. S., its possessions and Canada by years. During 1930 the total rose from 66 to 167

ESTABLISHING itself as a vehicle with a very definite field of usefulness the trolley bus during 1930 made a notable record. The number of systems operating this type of vehicle was increased from seven to twelve, the number of trolley buses in service or on order was increased 176 per cent and the one-way route mileage rose from 27.79 to 70.05. It is apparent also that this interest in the trolley bus is to continue and that 1931 will see an expansion as great as or even greater than that experienced during the past year. One company states: "Considering trolley buses for one or two lines now served by street cars." Another says: "Contemplating an original installation," and still another: "Data on operations now being prepared." Expenditure blanks received from other companies indicated that they are planning to start new systems.

Of the total of 116 vehicles purchased during 1930, 105 were for new installations. The other eleven were bought by a system already operating two. One-way route mileage of the five new systems totaled 34.90. Extensions by two other systems added another 7.36 miles. With these expansion programs the totals for the industry were brought to twelve operating systems, 182 trolley buses and 70.05 route-miles.

By far the greatest number of vehicles were purchased by the Chicago Surface Lines. Altogether 48 Twin Coach, 26 Brill-American, eleven St. Louis, two A.C.F. and two Cincinnati trolley buses were ordered. Five Twin Coach, five Brill-American and five St. Louis vehicles have not been delivered. Orders for these were placed in December. The two A.C.F. and two Cincinnati trolley buses have been delivered on trial. The second largest purchase was made by New Orleans Public Service, Inc. This company bought eleven Cincinnati trolley buses for use on an additional line established in November. Other orders included four Cincinnatis for the Tennessee Public Service Company, formerly the Knoxville Power & Light Company, six Twin Coaches for the Detroit Department of Street Railways, one Twin Coach and one A.C.F. for the Brooklyn & Queens Transit Corporation, and four Brill-Americans for the Rockford Electric Company. With the exception of the four trolley buses delivered to Knoxville, which have a seating capacity of 43 passengers, each of the vehicles seats 40 persons. All of the vehicles are equipped with two motors with a rating of 50 hp. each. The manufacturers of the electrical equipment are shown in an accompanying table.

The seven systems operating trolley buses at the end of 1929 had a total one-way route mileage of 27.79. During 1930 the Utah Light & Traction Company established a new line, adding 2.10 route-miles. New Orleans Public Service, Inc., also started another line and added 5.26 miles, bringing the total extensions for the year up to 7.36 miles. Of the new installations during 1930 which added 34.90 one-way route-miles, the Chicago Surface Lines added 17.55 miles, the Tennessee Public Service

Present Trolley Bus Operations in the United States and Its Possessions

Company	City	Date Started	Equipment	Present One-Way Mileage	Type of Service	Reasons for Selection
United Railways & Electric Company of Baltimore	Baltimore, Md.	Nov. 1, 1922	3 Brill	6.60	Feeder, from Randallstown to end of car line	To give permanent form of transportation to a growing real estate development.
Philadelphia Rapid Transit Company	Philadelphia, Pa.	Oct. 14, 1923	11 Total 9 Brill, 28 pass. 1 Berg, 27 pass. 1 Brill-American, 30 pass.	2.80	Crosstown, through industrial district in south part of city	Service was needed in short period. Also deemed best vehicle to develop the territory.
New York State Railways	Rochester, N. Y.	Nov. 1, 1923	12 Brockway, 25 pass.	3.50	Crosstown, connecting industrial and residential sections. Crosses 5 car lines	Economical operation principal reason.
Capitol District Transportation Company, subsidiary of United Traction Company	Cohoes, N. Y.	Nov. 2, 1924	4 Brockway-Wason	2.53	Extends to residential areas from center of business district	Replaced belt street car line. Tracks needed reconstruction. Allowed desirable route change.
Utah Light & Traction Co.	Salt Lake City, Utah	Sept. 9, 1928	26 Total 11 Versare, 43 pass. 8 Cincinnati, 43 pass. 7 Twin Coach, 40 pass.	10.29	Lines join well built up residential areas with main business district	Replaced railway lines. Necessity for reconstructing track. To eliminate paving liabilities. Vehicle considered economical and attractive for public.
Manila Electric Company	Manila, P. I.	Feb., 1929	8 Twin Coach, 40 pass.	2.96	Feeder, from city limits to outlying terminus for two street car lines	Replaced car line. Track needed rebuilding. Economical as compared to gasoline bus, because of high fuel cost.
New Orleans Public Service, Inc.	New Orleans, La.	Dec. 2, 1929	13 Total 11 Cincinnati, 40 pass. 1 Twin Coach, 40 pass. 1 A.C.F., 42 pass.	6.47	One line a feeder from a residential district to a car line. The other a crosstown feeder in residential section. Crosses five car lines.	Both lines substituted for car lines. Vehicles considered more economical and attractive for these routes.
Chicago Surface Lines	Chicago, Ill.	Apr. 17, 1930	89 Total 43 Twin Coach, 40 pass. 21 Brill-American, 40 pass. 6 St. Louis, 40 pass. 2 A.C.F., 40 pass. 2 Cincinnati, 40 pass. Equipment ordered, but not delivered. 5 Twin Coach, 40 pass. 5 Brill-American, 40 pass. 5 St. Louis, 40 pass.	17.55	All lines serve well developed residential districts. Join outlying business centers and reach few industrial areas. Two lines extend from car lines. Two others cross several east and west car lines.	To give needed service in large area in northwestern section of city. Replaced only .62 mile of car line and 1.5 mi. of bus line. Majority of mileage as extensions into new territory.
Tennessee Public Service Company	Knoxville, Tenn.	Apr. 28, 1930	4 Cincinnati, 43 pass.	5.27	Extends from heart of city to suburban residential area outside of city limits.	Replaced car line. Widening of highway would have required reconstruction of track.
Detroit Department of Street Railways	Detroit, Mich.	June 14, 1930	6 Twin Coach, 40 pass.	5.63	Extends from car line in northwest section of city through a residential area, terminating in a large park. One big factory along route.	Replaced bus line. Considered suitable type of vehicle for developing this area.
Brooklyn & Queens Transit Corp.	Brooklyn, N. Y.	July 23, 1930	2 Total 1 Twin Coach, 40 pass. 1 A.C.F., 40 pass.	0.75	Joins two important car lines and crosses a subway line in heavy residential area	Placed in service to determine popularity of this type of vehicle with public.
Rockford Electric Company	Rockford, Ill.	Dec. 10, 1930	4 Brill-American, 40 pass.	5.70	Extends from center of city to residential area in northeastern section of city. Makes large loop in this district	Replaced two car lines. Part of track would have required rebuilding. Vehicles considered economical and attractive.

Company, 5.27; the Detroit Department of Street Railways, 5.63; the Brooklyn & Queens Transit Corporation, 0.75, and the Rockford Electric Company, 5.70. With the previous route-mileage, extensions and new installations, the total route-mileage, as of Dec. 31, 1930, is now 70.05.

Chicago Has Largest System in World

Trolley bus service was first inaugurated in Chicago on the Diversey Line in the northwest section of the city on April 17, 1930. Additional trolley buses were subsequently placed in operation in the same section of the city on the Central Avenue, Narragansett Avenue and Elston Avenue lines on June 8, June 29 and July 1, respectively. These operations were the result of a decision by the Illinois Commerce Commission, dated March 6, 1930, directing the withdrawal of the Chicago Motor Coach Company buses from the northwest section of the city and directing the Chicago Surface Lines to establish bus service as extensions of its rail lines in this territory.

The original order for trolley buses totaled 41 vehicles, of which 29 were Twin Coach, six were Brill-American and six were St. Louis. Within a few weeks after service was started, additional trolley buses were needed and the fleet was increased to 55 by the purchase of seven Twin Coaches and seven Brill-Americans. About three months later seven more Twin Coaches and eight Brill-Americans were added, bringing the total up to 70. With this number the Chicago Surface Lines became one of the three largest trolley bus systems in the world. A little later four more vehicles were received on trial, two

Rockford bought four Brill-Americans for its new installation, made in December. Chicago ordered 26 of similar design during the year

Six Twin Coaches were placed in service in Detroit in June. Chicago ordered a total of 48 of these vehicles in 1930 and Brooklyn received one for its new line

from the American Car & Foundry Motors Company and two from the Cincinnati Car Corporation, making a total of 74 in operation before the close of the year. During December, however, fifteen more vehicles were ordered, of which five were Twin Coach, five, Brill-American, and five, St. Louis. When these are delivered the total in operation will be increased to 89, making the fleet the largest in the world. All of the Chicago routes carry a heavy volume of traffic. The Central Avenue and Diversey Avenue lines, in particular, require frequent headway and a large number of vehicles to handle the passengers.

Knoxville Starts 5.27-Mile System

The second new installation of 1930 was made in Knoxville on April 28, four trolley buses of the Cincinnati Car Corporation being purchased for this installation. The route, which is 5.27 miles in length, extends from the heart of Knoxville's business district to a point to the southwest beyond the city limits. After leaving the business district the route enters one of the finest residential districts in the city. Service on this line previously was given by street cars which operated through paved streets to the city limits, and from there to the end of the line on open track at the side of the highway. About a year and a half ago the company was faced with the problem of rehabilitating and extending the car line. Subsequently, it was decided by the city council to undertake street widening and repaving. Negotiations with the company resulted in a decision to remove the track and install trolley buses.

Accompanied by appropriate ceremonies, the Department of Street Railways of Detroit, Mich., made the third new installation of trolley buses on June 14. Six Twin Coaches were purchased to give service on the 5.63-mile route. The line extends from a car line, through a residential district in the northwest part of the city to a large park. For about 3.35 miles the line travels through a rapidly developing district. The remainder is through a thinly populated area. However, many people use the line during the summer to reach the park. Trolley buses were selected on this line to replace gasoline buses. The new vehicles were considered particularly attractive for the public in building up patronage, and also economical to operate.

On July 23 the Brooklyn & Queens Transit Corporation started its experimental trolley bus system. The route is only 0.75 mile in length, but it joins two important street car lines and crosses a subway line. One Twin Coach and one A.C.F. were purchased for this in-

Knoxville began its trolley bus service in April with four Cincinnati vehicles. New Orleans placed eleven of this type in operation and Chicago received two

Six St. Louis trolley buses were included in the original Chicago fleet. Five more have been ordered for the same system and will be delivered early in 1931

Trolley Buses Ordered by Electric Railways During 1930, Totaling 116

Electric Railway and City	Number Ordered	Vehicle Manufacturer	Seating Capacity	Number of Motors and Rating of Each	Manufacturer of Motors
Chicago Surface Lines, Chicago, Ill.	48	Twin Coach	40	2-50 hp.	Westinghouse
	26	Brill-American	40	2-50 hp.	General Electric and Westinghouse
	11	St. Louis	40	2-50 hp.	General Electric
	2	A.C.F.	40	2-50 hp.	Westinghouse
	2	Cincinnati	40	2-50 hp.	....
Tennessee Public Service Company, Knoxville, Tenn.	4	Cincinnati	43	2-50 hp.	General Electric
Department of Street Railways, Detroit, Mich.	6	Twin Coach	40	2-50 hp.	Westinghouse
Brooklyn & Queens Transit Corp., Brooklyn, N. Y.	1	Twin Coach	40	2-50 hp.	Westinghouse
	1	A.C.F.	40	2-50 hp.	Westinghouse
New Orleans Public Service, Inc., New Orleans, La.	6	Cincinnati	40	2-50 hp.	General Electric
	5	Cincinnati	40	2-50 hp.	Westinghouse
Rockford Electric Co., Rockford, Ill.	4	Brill-American	40	2-50 hp.	General Electric

stallation. This type of service was started principally to determine the reaction of the public to the new type of vehicle.

The fifth new installation of the year was made by the Rockford Electric Company, Rockford, Ill., on Dec. 10. Four Brill-Americans were bought to give service on the 5.7-mile system. The route has a two block loop in the downtown business district and extends into a well developed residential district. A 3.5-mile loop comprises the outer portion of the route. For more than a year the Rockford Electric Company had been considering trolley bus operation. The plan to install a system was hastened, however, by the city's decision to pave a portion of a street in which tracks of the transportation company were located. Two car lines were replaced by the new system.

By adding another route of 2.10 miles to its system, the Utah Light & Traction Company increased its total route mileage to 10.29. No additional vehicles were purchased to give this service. A total of 26 vehicles are in use in Salt Lake City.

In November, 1929, the New Orleans Public Service, Inc., started its trolley bus system with two vehicles on a route 1.21 miles in length. Satisfaction with this installation led to a large expansion program, which became effective in November of 1930. At this time the company installed eleven trolley buses on its Broadway line, 5.26 miles in length. The route replaced a car line, which crosses several other car lines in a well built-up residential district. With both lines now in operation, New Orleans has a total of thirteen vehicles and 6.47 miles of route.

As shown in an accompanying chart, there were no trolley buses in operation in the United States, its possessions, or Canada at the beginning of 1921. Previous to this date, however, there were two systems started and abandoned, and two others that were reported to be in operation. The first installation, about which any definite information is known, was made by the Pacific Electric Railway in 1910. Two Oldsmobiles, originally converted to buses and later to trolley buses by the substitution of two 15-hp. motors for the engines, were placed in service on a 1.50-mile route, between the end of a car line and a real estate subdivision in Laurel Canyon, Hollywood. An early report indicates that the operation was successful for a time. The second known installation was made by the Merrill Railway & Light Company, Merrill, Wis., in January, 1913. One vehicle was used for this service. Operation was abandoned in December of the same year. It has been reported that this vehicle was purchased by the West End Street Railway and placed in operation in Sconticut Neck, Mass., in 1916. The other report stated that a trolley bus was operated in Greenwich, Conn., before trolley cars were developed.

One-Way Trolley Bus Route Mileage in the United States and its Possessions

Route mileage on Dec. 31, 1929	.....	27.79
Extensions During 1930		
Utah Light & Traction Company	2.10	.....
New Orleans Public Service, Inc	5.26	.....
Total extensions		7.36
New Installations During 1930		
Chicago Surface Lines	17.55	
Tennessee Public Service Company	5.27	
Detroit Department of Street Railways	5.63	
Brooklyn & Queens Transit Corporation	.75	
Rockford Electric Company	5.70	
Total of new installations		34.90
Route mileage on Dec. 31, 1930		70.05

INTERESTING TREND FROM 1921 TO PRESENT

Analyzing the accompanying chart a steady growth is shown between the beginning of 1921 and the end of 1924. No change was made during 1925, but after that year the number decreased to 29, at the end of 1927. The next two years saw increases and 1930 showed a very sharp rise. Of the twelve vehicles in service at the end of 1921, eight were in Staten Island and four in Toronto. The next year saw an increase to 36, with the addition of fifteen more vehicles in Staten Island and new installations of two in Minneapolis, four in Windsor and three in Baltimore. The system of the United Railways & Electric Company of Baltimore, using three vehicles, is still in operation. In 1923 two more installations were made that are still in operation, Philadelphia starting with ten and Rochester with twelve. Another system, Petersburg, started with two. During that year, however, the Toronto and Minneapolis vehicles were abandoned, leaving the total at 52. During 1924 no abandonments were made. Petersburg added three more vehicles and the United Traction Company started a system in Cohoes, N. Y., using four vehicles. This system is still in operation. No changes occurred in 1925, the total vehicles in operation remaining at 59. In the next year Windsor abandoned its operation, leaving the total at 57. The next year saw the abandonment of the Petersburg operation, and the entire Staten Island system, leaving a total of 29.

The upward trend of the curve, which started in 1928, was due to the installation of twelve vehicles in Salt Lake City. In the next year, 1929, Salt Lake city added fourteen more, Philadelphia added one, and two new installations were made, one of eight in Manila and one of two in New Orleans. The total of 167 in operation at the end of 1930 has been accounted for previously. An analysis of all present trolley bus operations, giving the companies, the dates service was started, equipment being used, one-way route mileage, types of service and reasons for selection, is presented in an accompanying table.

1930 Sees Rapid Strides in

Railroad Electrification

Cleveland terminal and Lackawanna suburban system are notable additions to electrified trackage. Construction work progressing on Pennsylvania, New York Central and Reading installations

NOTABLE progress was made in the field of railroad electrification during the past year. The project attracting the greatest attention was naturally the Pennsylvania Railroad, on account of the enormous scope of the installation, which involves all the freight and passenger service between New York and Washington on 325 miles of line and 1,300 miles of track. During the year just closed electric operation was inaugurated on the New York division between Philadelphia and Trenton and on the branch between Philadelphia and Norristown. The underground Broad Street suburban station and the connecting subway were put in service on Sept. 28, clearing the way for the construction of the new terminal in West Philadelphia and the abandonment of the old Broad Street station and the elevated line adjacent to Market Street. Work on the overhead structures between New York and New Brunswick is now in progress, upon completion of which the installation on the gap between New Brunswick and Trenton will be undertaken. After this is finished, through electric service between Philadelphia and Wilmington, Paoli and New York will be possible, with a connection over Hell Gate Bridge to New Haven via the New Haven Railroad.

Electrification of the Reading Company's lines radiating from Philadelphia, comprising 60 miles of line and 150 miles of track, is progressing. The system has been extended considerably, and the construction approved now includes the lines from Reading Terminal to Wayne Junction, Jenkintown, Langhorne, West Trenton, and from Jenkintown to Glenside, Hatboro, and from Landsdale to Doylestown. It also is expected that a second step in the program of expansion will be to equip the line from West Trenton to Bound Brook and ultimately to New York over the Central Railroad of New Jersey, and from Landsdale to Bethlehem. Electrification of the Schuylkill Valley lines probably also will be undertaken. It is estimated that this contemplated construction will cost $32,000,000 in addition to the original authorization of $20,000,000 and the recent authorization of $1,500,000. Operation over the first sections to be completed will start about July 1 with 70 motor cars.

Changes in Electrified Steam Railroad Track in 1930

Company	Miles of Track Extensions	Miles of Track Abandonments
Cleveland Union Terminals Co. Cleveland, Ohio	56.00	.....
Delaware, Lackawanna & Western R.R., Hoboken, N. J.	160.00	.....
Detroit, Toledo & Ironton R.R., Detroit, Mich.	.....	50.00
Illinois Central R.R., Chicago, Ill.	2.42	.....
Long Island R.R., New York, N. Y.	1.23	.....
New York Central R.R., New York N.Y.	0.33	....
New York, New Haven & Hartford R.R., Bristol division	.....	0.14
New York, New Haven & Hartford R.R., New York, N. Y.	1.04	0.25
Pennsylvania R.R., New York district	1.89	.....
Pennsylvania R.R., Philadelphia division	171.27	2.38
	394.18	52.77

One of the Pennsylvania Railroad's new locomotives for high-speed passenger service

Electric train operation in the new Cleveland Union Terminal district was begun in June of last year, eliminating to a large extent the use of steam engines in the congested city district. The service uses 22 locomotives of 204 tons each, which were delivered at the end of 1929.

Another major electrification project, which is combined to a considerable extent with self-propelled locomotives, is the West Side project of the New York Central in New York City. The equipment includes 35 oil-electric-battery locomotives, designed for handling switching service either from the third rail, overhead trolley, or independently by use of the oil engine or storage battery, on the lower part of Manhattan Island. For handling freight northward to Harmon, 42 standard electric freight locomotives are under construction and probably will be delivered by the middle of this year.

One of the most interesting installations of the past year is the Delaware, Lackawanna & Western suburban system from Hoboken to Montclair, Dover and Gladstone. It is novel in using 3,000 volts direct current for

Twenty-two locomotives of this type are used at the Cleveland Union Terminal

motor cars and in the use of mercury are rectifiers for converting all of the current.

A number of railroads have increased their electrified mileage during the year, as is indicated in the table. The largest additions are those made by the Pennsylvania Railroad, already referred to, which total 171.27 miles. Some minor abandonments are noted. Besides these the Detroit, Toledo & Ironton has discontinued the experimental electrification begun some years ago by the Ford Motor Company interests, and has dismantled the overhead system. Only two locomotives were purchased for this line, and they never were used in regular service.

Purchases of equipment for electrified roads were numerous during the year. Six locomotives were built by the Pennsylvania Railroad, co-operating with the electrical manufacturers, in order to permit extensive tests before placing the large orders.

Four 100-ton locomotives were placed in service by the Illinois Central Railroad for switching and transfer service in Chicago. Each unit is capable of handling maximum train cuts of 2,000 tons.

The Great Northern Railway received four locomotives similar to those already in service. There are ten 200-ton locomotives under construction for the New York, New Haven & Hartford, which will be used for main-line passenger service into and out of New York.

The largest individual purchase of rolling stock for electrified steam railroad service was that of 70 multiple-unit passenger cars by the Reading Company. The cars have an over-all length of 72 ft. 11 in., seat 84 passengers, are equipped with two 275-hp. motors, and weigh complete 128,000 lb. The Long Island Railroad ordered 45 multiple-unit cars for its suburban service, of which 25 were built by the Pressed Steel Car Company, and the others by the American Car & Foundry Company. These cars are smaller and lighter than those ordered by the Reading Company, being 63 ft. 11 in. in length, and weighing 117,000 lb. Two 225-hp. motors are provided, and the cars seat 72 passengers.

The Long Island Railroad also converted 40 steam railroad passenger coaches for electrical service, equipping them with two 225-hp. motors each. The Pennsylvania Railroad converted 58 railroad passenger coaches and one baggage and mail car for its electrified division. The passenger cars have a seating capacity of 72, are 64 ft. 6 in. in length and weigh 128,000 lb. Two motors of 250-hp. are provided for each unit. The New York, New Haven & Hartford Railroad's purchases included 31 multiple-unit motor cars, each seating 120 passengers, and two multiple-unit combination baggage and passenger cars, seating 87 passengers. This railroad also converted nineteen former steam railroad coaches.

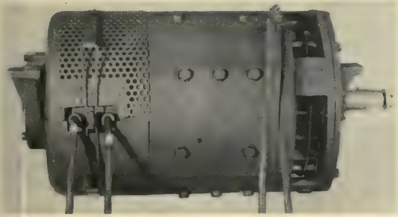
Installations of Electrical Operation of Steam Railroads in the United States

Based on original data, supplemented by reports of the American Electric Railway Engineering Association and the National Electric Light Association

Railroad—Location	Electric Mileage		System			Year Electrified	Electric Locomotives		Motor Cars	Daily Trains		Annual Car-Miles	
	Route	Track	Volts	Cycles	Contact Line		Pass.	Freight		Pass.	Freight	Pass.	Freight
Baltimore & Ohio—Baltimore, Md.	3.6	9.1	675	d.c.	Rail	1895	12	*e*	0	13	21	142,590	1,297,900
Boston & Maine—Hoosac Tunnel, Mass.	7.9	21.4	11,000	25	Over'd	1911	10	*e*	0	12	28	213,753	3,969.284
Butte, Anaconda & Pacific—Butte-Anaconda-Rocker, Mont	37.4	145.8	2,400	d.c.	Over'd	1913	1	27	0	4	6	113,345	5,920,328
Chicago, Milwaukee, St. Paul & Pacific—Harlowton, Mont,-Avery, Idaho	440.1	578.0	3,000	d.c.	Over'd	1916	9	27	0	4	......	6,558,814	49,149,252
Othello-Tacoma-Seattle, Wash	218.4	305.4	3,000	d.c.	Over'd	1920	5	15	0	6	......	3,741,527	14,905,677
Great Falls, Mont. (Yard)	0.0	6.9	1,500	d.c.	Over'd	1915	......	......	......	......	......	....	....
Gallatin Valley Branch	18.8	24.8	600	d.c.	Over'd	......	......	1	1	......	......	....	....
Cleveland Union Terminal—Cleveland, Ohio	18.8	56.0	3,000	d.c.	Over'd	1930	22	0	0	......	......	....	....
Delaware, Lackawanna & Western—Hoboken-Dover-Gladstone, N. J.	70.0	160.0	3,000	d.c.	Over'd	1930	......	1	141	......	......	....	....
Erie—Rochester-Mt. Morris, N. Y	34.0	38.0	11,000	25	Over'd	1907	0	0	8	20	0	495,864	0
Ft. Dodge, Des Moines & So.—Ft. Dodge-Rockwell, Iowa	146.6	194.0	1,200	d.c.	Over'd	1912	0	12	12	8	12	275,000	2,585,657
Grand Trunk (Canadian National)—Port Huron, Mich.-Sarnia, Ont	3.7	12.2	3,300	25	Over'd	1908	0	9*e*	0	9	35	127,367	2,532,176
Great Northern—Skykomish-Wenatchee, Wash	72.8	93.2	11,500	25	Over'd	1929	4*e*	5	0	8	4	1,625,895	7,715,872
Illinois Central—Chicago-Richton, Ill	37.8	154.5	1,500	d.c.	Over'd	1926	0	4	140	570	0	10,246,150	0
Long Island—New York, N. Y	122.8	362.6	650	d.c.	Rail	1905*c*	7	8	742	980	8	42,914,621	....
Bay Ridge-Fresh Pond Jc., N. Y	11.9	84.4	11,000	25	Over'd	1927	0	7	0	0	30	0	....
Michigan Central—Detroit, Mich.-Windsor, Ont	4.5	28.6	650	d.c.	Rail	1910	12*e*	......	0	38	47	388,044	2,272,842
New York Central—N. Y.-Croton-White Plains, N .Y.	63.1	365.3	650	d.c.	Rail	1906*c*	83	9	355	645	40	24,672,992	2,494,351
New York, New Haven & Hartford—Nantasket Jc.-Pemberton, Mass	6.9	13.1	650	d.c.	R&O	1895	0	0	8	36	0	....	
Providence, R. I.-Fall River, Mass	23.9	38.5	650	d.c.	Over'd	1901	0	0	22	42	0	702,382	
Woodlawn, N. Y.-New Haven, Conn. *f*	75.2	509.8	11,000	25	Over'd	1907*c*	71	73	65	190	44	24,523,377	53,000,000
Stamford-New Canaan, Conn	7.9	9.8	11,000	25	Over'd	1908	*g*	*g*	*g*	32	2	*g*	*g*
S. Norwalk-Danbury, Conn	23.7	31.0	11,000	25	Over'd	1925	*g*	*g*	*g*	8	6	*g*	*g*
Port Morris-Fresh Pond Jc., N. Y. *h*	9.0	26.3	11,000	25	Over'd	1918*c*	*g*	*g*	*g*	18	21	350,000	9,149,807
Norfolk Southern—Norfolk-Virginia Beach, Va	44.5	54.3	575	d.c.	Over'd	......	2	......	19	......	......	....	....
Norfolk & Western—Bluefield-Iaeger, W. Va	63.7	209.5	11,000	25	Over'd	1915*c*	0	16	0	......	34	....	....
Northwestern Pacific—Corte Madera-Sausalito, Cal	20.6	40.4	600	d.c.	Rail	......	......	......	44	......	......	....	....
Pennsylvania—Camden-Atlantic City, N. J	75.0	150.1	650	d.c.	Rail	1906	0	0	107	48	0	3,310,533	0
New York, N. Y.-Manhattan Transfer, N. J	13.4	105.4	675	d.c.	Rail	1910	46	0	0	200	0	....	0
Philadelphia District (*a*)	88.8	428.9	11,000	25	Over'd	1915*c*	1	0	281	247	0	4,869,635	0
Reading—Philadelphia, Pa., and suburbs	......	......	11,000	25	Over'd	*b*	......	......	......	......	......	....	....
Southern Pacific—Oakland-Alameda-Berkeley, Cal	50.0	118.8	1,200	d.c.	Over'd	1911	0	3	87	780	0	4,027,576	0
Virginian—Roanoke, Va.-Mullens, W. Va	134.0	229.8	11,000	25	Over'd	1925*c*	0	14	0	0	19	0	30,344,276

a Includes lines between new Broad Street Station and Paoli, Chestnut Hill, Wilmington, Trenton and Norristown. *b* To be completed in 1931. *c* Includes extensions in subsequent years. *d* Under construction. *e* Passenger and freight. *f* Operates on New York Central between Woodlawn and Grand Central Terminal, New York. *g* Included in Woodlawn-New Haven section. *h* New York Connecting R.R.

NEW PRODUCTS
for the Railways' Use



GE-1154-A motor has been designed for an accelerating rate of 3 m.p.h.p.s. for installation on trolley bus or street car

Improved commutating characteristics and high accelerating current feature the new GE-702 motor

Higher Acceleration and Lower Weight in New G. E. Motors

TWO new motors, one designed for use on either trolley buses or street cars and the other exclusively for street cars, have been introduced by the General Electric Company. The first is designated as GE-1154-A, a 50-hp. 600-volt motor; the other is known as GE-702, a 35-hp. 600-volt motor.

Increased capacity for a given weight has been obtained in the GE-1154-A motor by the use of rolled plate and fabricated construction. It weighs approximately 785 lb. The motor normally uses two brushholders. The brushholder mounting may be placed at the top or bottom, as desired. With bottom brushholders, trap doors may be omitted. This feature permits easier inspection. Trailing brushholders are used instead of radials for single-end operation, insuring minimum arcing and maximum brush life.

The outside diameter is approximately 16½ in. There is no frame head on the commutating end, thereby eliminating one loose piece and several bolts to hold it in place. The field coils are wound with strip copper.

Annular type Lubriseal ball bearings, used on both ends of the motor, are greased in openings through the bearing caps. A grease slinger is provided on the armature shaft to throw out excess grease which may pass the seals. Air is forced through the motor by means of a radial blade fan which is bolted to the armature head. The fan is designed to expel a maximum amount of air with minimum noise.

Two GE-1154-A motors are designed by the manufacturer for general use on trolley buses with capacities of from 35 to 43 passengers. On level road operation an accelerating rate of 3 m.p.h.p.s. may be obtained. The motor may be used for installation on rail cars with the proper type of trucks.

Four commutating field coils are built into the GE-702, affording improved commutating characteristics and permitting a high accelerating current. The motor weighs approximately 1,500 lb.

The fan of the GE-702 is located on the commutator end, and the air is taken in at the pinion end. Cleaner air is thus obtained, since the air intake is farther from the wheel. The gear case acts as a baffle to the incoming air to prevent dirt thrown up by the wheels from entering the motor. The air travels in parallel paths over the fields and armature and through longitudinal ducts in the armature before reaching the commutator and brushes. Any foreign matter which does enter the cooling air has a tendency to settle out before reaching the commutator.

A bolted-type commutator construction instead of the ring-nut construction is used. The commutator shell and armature head are an integral one-piece casting, permitting less movement of armature leads and consequently less lead breakage. The motor is equipped with pads suitable for mounting either top or bottom brushholders, and constant oil level bearings on the armature and axle. The motor has a flat speed characteristic, desirable in city service since it allows acceleration at full maximum rate to a higher speed than would be possible with a steep speed characteristic.

Motor Ratings

	Horsepower at Shaft	Volts	Amps.	R.P.M.	Temp. Rise by Resistance, Deg. C.
GE-1154-A—Hourly	50	600	71	1,950	100
Continuous	46	600	65	1,990	85
GE-702—Hourly	35	600	50	1,220	100
Continuous	31	600	45	1,280	85

◆

Insulated Aluminum Wires and Cables

UNDER the trade name Electral, insulated aluminum wires and cables have been recently announced by the General Cable Corporation. As aluminum wire has generally been used heretofore in the form of bare conductors, this represents a new development. The initial group of insulated aluminum conductors includes such construction as network cable, non-metallic underground cable, insulated line wire, tree wire, armored cables, magnet wire, starter cable and car wiring cable.

A new departure in connection technique has been developed, together with the required fittings and accessories. Connections will be made by applying high pressures to sleeves by means of a specially designed lightweight hydraulic press. For applications in which tensile strength is not a prime consideration, the conductors of Electral wires and cables are all-aluminum.

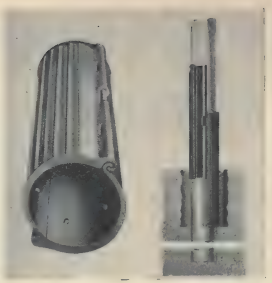
In the field of both underground and overhead power distribution, insulated aluminum conductors are said to have advantages in certain classes of work. Recent tests have indicated that persistent disturbance due to underground short circuits is less with aluminum than with other conductor material. Electral cables will run cooler under a given load since their larger conductor cross sections results in greater heat radiation.

◆

Three-Pole Magnet Handles Single Rails

RAILS can be distributed or stored conveniently by means of an electro-magnet manufactured by the Ohio Electric Manufacturing Company. The magnet can lift the standard 30-ft. length of rail, weighing 130 lb. per yard, at any point the contact is made. No attendant is required when lifting a rail, as there is an automatic adjustment of balance between the magnet and the rail which slides the magnet to the center of gravity of the rail. The magnet weighs 935 lb. and operates on direct current, taking about 1.5 kw.

Balancing adjustment of magnet eliminates necessity for an attendant when lifting a single rail


Protective shield to reinforce corroded pole

Protective Shield for Steel Poles

TUBULAR steel poles which have become corroded or pitted at the grade line may be reclaimed through the use of the Elreco protective shield, manufactured by the Electric Railway Equipment Company, Cincinnati, Ohio. These shields are made from two ribbed, malleable iron duplicate castings with a tongue and groove joint, and can be applied directly to erected poles without slipping the sleeves over the top of the poles or removing any attachments, such as crossarms or span wire bands. Insertion of the shield can be accomplished at little expense and time. The concrete bed is chipped out around the pole to a proper depth below the grade line so that the shield will cover the corroded part of the pole. One-half is placed in position, and the other half is slipped into place and the space formed by a series of lugs between the pole surface and the malleable iron shield is sealed with rich cement grout. In this manner the stress is uniformly distributed over the entire surface of the shield and the corroded surface of the pole is sealed against further rust. As the life of most steel poles is greatly affected by corrosion below the grade line, any scheme that prevents or reduces such corrosion will increase their length of service.

◆

Electrically Heated Windshield Glass

CLEAR vision for vehicles under sleet-forming driving conditions is the purpose for which electrically heated glass has been developed by the Protex Glass Company, New York. Protex glass is a plate glass having nichrome wires embedded in a central plane parallel to the two surfaces. The wires run parallel to each other, and are spaced about 2 in. apart. These wires act as heaters when connected to an electrical supply, such as a storage battery, causing the temperature of the glass to be raised sufficiently above that of the surrounding atmosphere to prevent formation of sleet on its surfaces.

The nichrome wire is of No. 22 B & S gage and has a resistance of $\frac{1}{10}$ ohm per inch. As a result of tests conducted under conditions simulating sleet-forming weather, it has been found that 1.6 amp. on all wires is sufficient to maintain the necessary heat in the glass to prevent sleet formation.

A number of tests were made by an independent laboratory to determine the approximate average temperature rise in still air and in the draft of a blower, the maximum safe current-carrying capacity, and the effect of ice water thrown on the heated windshield. Further tests were made by placing the Protex glass in a refrigerating plant under actual sleet-forming conditions. Satisfactory results were obtained from these tests, although the glass was exposed to the extreme temperature on both of its faces, a more severe test than it will meet in actual field conditions when one of its faces will be protected by the warmer temperature inside of the car. The maximum safe current-carrying capacity was found to be 3 amp. Under this condition, when the glass reached a uniform temperature ice water was thrown upon it without any indication of the glass cracking.

Monthly and Other Financial Reports

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
Market Street Railway, San Francisco, Cal.					
November, 1930	729,407	615,613*a*	....	113,794	60,457
November, 1929	799,843	656,119*a*	....	143,724	85,452
12 mo. end. Nov., 1930	9,238,086	7,859,492*a*	....	1,378,594	720,257
12 mo. end. Nov., 1929	9,584,907	8,084,583*a*	....	1,500,324	786,014
Capital Traction Company, Washington, D. C.					
November, 1930	346,054	245,786	27,695	72,806	42,659
November, 1929	355,651	249,288	28,487	78,108	47,952
11 mo. end. Nov., 1930	3,794,635	2,763,534	292,909	756,994	421,687
11 mo. end. Nov., 1929	3,919,817	2,807,951	303,697	829,643	494,734
Jacksonville Traction Co., Jacksonville, Fla.					
October, 1930	84,424	70,012	6,362	7,641	....
October, 1929	96,472	79,495	9,037	7,389	....
12 mo. end. Oct., 1930	1,054,247	860,771	100,044	87,403	*65,525*
12 mo. end. Oct., 1929	1,150,146	942,972	107,807	93,124	*64,125*
Jacksonville Traction Co., Jacksonville, Fla.					
November, 1930	81,250	69,437*a*	....	11,813	....
November, 1929	92,574	82,697*a*	....	9,877	....
12 mo. end. Nov., 1930	1,042,923	853,584*a*	....	89,339	*62,599*
12 mo. end. Nov., 1929	1,143,880	1,049,140*a*	....	94,740	*62,691*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
October, 1930	86,787	54,392	9,149	11,989	11,097
October, 1929	88,577	52,387	7,932	16,151	15,298
10 mo. end. Oct., 1930	863,993	513,076	89,754	166,773	154,617
10 mo. end. Oct., 1929	878,605	504,821	90,011	190,228	180,445
November, 1930	82,873	51,151	9,149	11,910	11,547
November, 1929	85,385	51,473	7,932	16,149	15,405
11 mo. end. Nov., 1930	946,866	564,227	98,903	175,172	166,164
11 mo. end. Nov., 1929	963,989	556 295	97,944	204,178	195,851
Chicago Surface Lines, Chicago, Ill.					
November, 1930	4,537,647	3,769,538*a*	....	768,108	712,177
November, 1929	5,246,124	4,046,792*a*	....	1,199,331	898,499
Des Moines Railway, Des Moines, Iowa					
October, 1930	163,958	118,125	14,000	31,833	*10,605*
United Railways & Electric Co., Baltimore, Md.					
November, 1930	1,263,811	858,087	124,960	291,562	9,200
November, 1929	1,407,934	919,304	142,421	355,717	72,462
11 mo. end. Nov., 1930	14,809,959	10,130,699	1,417,929	3,382,577	363,973
11 mo. end. Nov., 1929	15,246,268	10,367,494	1,483,178	3,559,670	454,133
Boston Elevated Railway, Boston, Mass.					
October, 1930	2,811,399	2,015,457	142,017	667,885	*35,272*
October, 1929	2,929,491	.2,048,406	137,268	758,760	64,866
Eastern Massachusetts Street Railway, Boston, Mass.					
November, 1930	590,856	436,626	12,406	152,324	205
November, 1929	663,198	436,562	19,805	232,687	86,076
11 mo. end. Nov., 1930	7,158,442	4,716,716	300,829	2,254,707	416,030
11 mo. end. Nov., 1929	7,817,586	4,947,492	338,222	2,750,358	870,240
Department of Street Railways, Detroit, Mich.					
November, 1930	1,481,136	1,270,111	63,460	152,517	4,890
November, 1929	1,932,988	1,477,477	61,987	403,476	256,822
12 mo. end. Nov., 1930	21,592,561	18,271,438	7,774,712	2,665,392	938,547
12 mo. end. Nov., 1929	26,520,209	20,983,064	748,021	4,907,464	3,245,066
Kansas City Public Service Co., Kansas City, Mo.					
November, 1930	706,577	572,066*a*	....	134,512	58,994*j*
November, 1929	746,136	615,461*a*	....	130,674	55,820*j*
11 mo. end. Nov., 1930	7,619,108	6,478,165*a*	....	1,140,943	277,223*j*
11 mo. end. Nov., 1929	8,180,254	6,659,560*a*	....	1,520,694	670,150*j*
Illinois Terminal Company, St. Louis, Mo.					
October, 1930	691,672	472,274	33,833	185,565	148,701*e*
October, 1929	709,727	494,451	24,164	191,112	133,256*e*
10 mo. end. Oct., 1930	6,370,838	4,407,653	302,513	1,660,252	1,242,571*e*
10 mo. end. Oct., 1929	6,875,318	4,776,835	235,210	1,863,146	1,379,810*e*
Omaha & Council Bluffs Ry., Omaha, Neb.					
October, 1930	242,060	159,093	....	82,967	8,932
October, 1929	235,545	170,436	....	65,109	*4,130*
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.					
October, 1930	75,708	61,553	4,800	13,010	*18,447*
October, 1929	92,098	62,446	4,300	30,444	*779*
10 mo. end. Oct., 1930	758,192	615,023	48,000	174,437	*136,236*
10 mo. end. Oct., 1929	846,679	633,507	74,860	248,404	*69,674*
Brooklyn-Manhattan Transit Corporation, New York, N. Y.*g*					
November, 1930	4,769,083	3,055,041	311,882	1,466,832	689,470
November, 1929	4,987,071	3,345,314	273,696	1,443,361	673,706
5 mo. end. Nov., 1930	24,381,309	15,925,389	1,635,100	7,160,699	3,301,056
5 mo. end. Nov., 1929	25,210,850	17,021,861	1,596,231	6,943,391	3,052,578
Brooklyn & Queens Transit Corporation, New York, N. Y.					
November, 1930	1,820,498	1,428,027	94,708	312,374	187,822
November, 1929	1,929,432	1,549,294	98,256	304,004	178,518
5 mo. end. Nov., 1930	9,374,743	7,360,625	522,698	1,562,897	940,771
5 mo. end. Nov., 1929	9,923,027	7,874,414	565,470	1,600,398	975,556
Hudson & Manhattan R.R., New York, N. Y.					
November, 1930	994,735	489,761*a*	....	504,973	169,465
November, 1929	1,059,112	510,620*a*	....	548,492	215,618
11 mo. end. Nov., 1930	11,143,748	5,625,788*a*	....	5,517,960	1,832,358
11 mo. end. Nov., 1929	11,405,284	5,740,671*a*	....	5,664,612	1,974,920
Interborough Rapid Transit Co., New York, N. Y.					
November, 1930	5,965,365	3,668,527	200,813	2,096,024	*272,021h*
November, 1929	6,276,425	3,666,977	201,549	2,407,898	*122,647h*
5 mo. end. Nov., 1930	28,531,026	19,215,922	999,517	8,315,586	*1,526,939h*
5 mo. end. Nov., 1929	29,237,885	18,662,339	1,001,249	9,574,296	*730,299h*
Long Island Railroad, New York, N. Y.					
October, 1930	3,371,761	2,181,119	265,227	920,743	729,067*e*
October, 1929	3,578,672	2,442,505	244,883	889,921	716,383*e*
10 mo. end. Oct., 1930	33,736,765	22,091,875	2,814,635	8,819,331	7,188,800*e*
10 mo. end. Oct., 1929	35,131,457	22,862,771	2,598,736	9,652,798	8,046,785*e*
New York Railways Corporation, New York, N. Y.					
October, 1930	485,203	422,453*a*	....	62,750	23,566*d*
October, 1929	525,979	459,873*a*	....	66,106	5,105*d*
10 mo. end. Oct., 1930	4,649,725	165,770*a*	....	483,955	82,510*d*
10 mo. end. Oct., 1929	5,222,073	570,227*a*	....	651,846	43,347*d*
New York, Westchester & Boston R.R., New York, N. Y.					
October, 1930	202,046	138,192*a*	....	63,854	*190,748*
October, 1929	218,467	136,808*a*	....	81,659	*157,911*
10 mo. end. Oct., 1930	2,110,568	1,231,802*a*	....	878,766	*1,671,948*
10 mo. end. Oct., 1929	2,111,277	1,285,020*a*	....	826,257	*1,544,186*
New York, Westchester & Boston R.R., New York, N. Y.					
November, 1930	184,690	170,542*a*	....	14,148	*216,451*
November, 1929	202,381	166,333*a*	....	36,048	*180,500*
11 mo. end. Nov., 1930	2,295,258	1,655,802*a*	....	639,456	*1,888,393*
11 mo. end. Nov., 1929	2,313,658	1,677,256*a*	....	636,402	*1,724,686*
Staten Island Rapid Transit Co., New York, N. Y.					
October, 1930	205,631	149,086	18,500	38,001	29,723*e*
October, 1929	229,918	161,196	18,000	50,722	40,227*e*
10 mo. end. Oct., 1930	2,091,833	1,541,879	173,000	375,393	281,347*e*
10 mo. end. Oct., 1929	2,225,217	1,654,132	176,800	394,268	328,335*e*
Third Avenue Railway, New York, N. Y.					
November, 1930	1,373,335	1,057,342	88,826	251,126	12,079
November, 1929	1,451,405	1,187,904	88,066	200,720	64,217
5 mo. end. Nov., 1930	7,037,955	5,442,872	469,448	1,246,428	49,500
5 mo. end. Nov., 1929	7,391,223	6,023,350	475,891	1,018,538	278,836
Scranton Railway, Scranton, Pa.					
3 mo. end. Sept., 1930	385,734	272,677*a*	....	113,057	*14,393c*
3 mo. end. Sept., 1929	412,399	296,742*a*	....	115,657	*11,697c*
9 mo. end. Sept., 1930	1,785,872	1,194,610*a*	....	591,262	70,689*c*
9 mo. end. Sept., 1929	1,888,925	1,298,574*a*	....	590,351	87,681*c*
United Electric Railwavs, Providence, R. I.					
October, 1930	531,803	....	....	....	41,223
October, 1929	616,686	....	....	....	89,228
10 mo. end. Oct., 1930	5,478,823	....	....	....	92,991
10 mo. end. Oct., 1929	6,044,029	....	....	....	354,856
Texas Electric Railway, Dallas, Texas					
10 mo. end. Oct., 1930	1,371,836	924,087	399,466*b*	....	48,283
10 mo. end. Oct., 1929	1,539,557	965,449	405,528*b*	....	168,580
Texas Electric Railway, Dallas, Texas					
11 mo. end. Nov., 1930	1,487,538	........*a*	....	411,508	35,311
11 mo. end. Nov., 1929	1,707,849	........*a*	....	574,288	190,742
Galveston-Houston Electric Railway, Houston, Tex.					
November, 1930	36,974	44,183*a*	....	12,791	....
November, 1929	42,237	26,745*a*	....	15,492	....
12 mo. end. Nov., 1930	507,435	331,234*a*	....	176,201	*93,685*
12 mo. end. Nov., 1929	592,019	363,464*a*	....	228,555	*41,255*
Houston Electric Co., Houston, Texas.					
October, 1930	267,306	159,886	21,613	85,806	....
October, 1929	289,119	176,475	27,114	85,529	....
12 mo. end. Oct., 1930	3,148,404	1,977,817	239,777	944,095	573,425
12 mo. end. Oct., 1929	3,384,334	2,096,068	295,212	999,153	598,303
November, 1930	247,210	176,739*a*	....	70,471	....
November, 1929	274,652	180,281*a*	....	94,371	....
12 mo. end. Nov., 1930	3,120,962	214,053*a*	....	906,909	550,635
12 mo. end. Nov., 1929	3,378,970	378,457*a*	....	1,000,513	609,607
Calgary Municipal Railway, Calgary, Alta.					
10 mo. end. Oct., 1930	798,270	529,890	....	268,379	5,531
10 mo. end. Oct., 1929	....	....	....	....	37,464
Lethbridge Municipal Railway, Lethbridge, Alta.					
9 mo. end. Sept., 1930	40,111	36,119	....	3,991	*19,273*
9 mo. end. Sept., 1929	....	....	....	....	*14,541*
Guelph Radial Railway, Guelph, Ont.					
11 mo. end. Sept., 1930	79,198	74,676	939	3,582	*30,551*
11 mo. end. Sept., 1929	....	....	....	....	*29,227*
Ontario Hydro Electric Railways, Essex District, Windsor, Ont.					
11 mo. end. Sept., 1930	953,756	816,094	5,478	132,183	*118,215*
11 mo. end. Sept., 1929	....	....	....	....	*47,568*
Regina Municipal Railway, Regina, Sask.					
10 mo. end. Oct., 1930	329,230	230,744	....	98,486	*55,741*
10 mo. end. Oct., 1929	....	....	....	....	12,671
Saskatoon Municipal Railway, Saskatoon, Sask.					
10 mo. end. Oct., 1930	307,000	220,505	12,007	74,407	*36,904*
10 mo. end. Oct., 1929	....	....	....	....	5,548
Mexico Tramways, Mexico City, Mex. (in pesetas)					
October, 1930	815,000	....	....	....	*108,040*
October, 1929	877,859	....	....	....	*699,880*
10 mo. end., Oct., 1930	8,356,310	....	....	....	*13,073*
10 mo. end., Oct., 1929	9,006,147	....	....	....	*121,281*

Italic figures indicate deficit. *a* Includes taxes. *b* Includes interest. *c* After depreciation. *d* Before interest on income bonds not declared. *e* Net after rents. *f* Balance applicable to return and surplus. *g* Including Brooklyn & Queens Transit System.
h After Manhattan Elevated rental. *j* Before depreciation.

NEWS *of the Industry*

LATE NEWS

Los Angeles, Cal.—A fleet of 25 additional green cars will go into service here as soon as they are completed at the Los Angeles Railway shops. The first two of the fleet were placed in service on Line "S" on Nov. 19, and since that time eight more cars have been added. The color scheme of these cars is similar to that of the other green cars added a year ago, with the exception that the roofs are painted in brown instead of silver. The attractiveness of the exterior is augmented by the use of new letter signs of the roller type, illuminated at night. The seats are finished in a light green leather which blends with the general color scheme.

◆

Chicago, Ill.—Instead of working the seven days to which they are entitled, 9,569 trainmen of the Chicago Surface Lines have voluntarily agreed to work an average of 5.66 days a week thus making it possible to keep the same number of trainmen on the payroll during the depression as during the banner year of the company's history. This action has made it possible to employ 2,280 men an average of 5.19 days a week.

◆

Springfield, Mass. — The Springfield Street Railway has received nine buses for use on a new loop line between Springfield and Chicopee Falls, to replace the Catherine Street line and part of the Liberty Street rail line. The new service will start soon after Jan. 1.

◆

Phoenix, Ariz.—The Municipal Street Railway showed a profit during the final weeks of 1930 for the first time since July 1. Speeding up the morning and evening schedules, with the addition of two extra crews, is believed to be the final factor that overcame the deficit.

◆

New Orleans, La. — The new transportation office building at the Poland Street carhouse of the New Orleans Public Service has been dedicated. The new building supplants the old structure at the rear of the carhouse.

◆

Columbus, Ohio—The Columbus Railway, Power & Light Company, has been authorized by the Ohio State Public Utilities Commission to discontinue operating cars from Minerva Park, located just outside the city, into Columbus. The order, however, requires the company to continue operating cars between Agler Road and the west end of Minerva Park, connecting with city cars at the corporation line.

◆

Chicago, Ill.—Seventy-one years ago a horse car rumbled along State Street. On Dec. 28 a horse car went back into active service for a brief time as the first car to move over a new service line extension officially opened in Lincoln Avenue, between Berwyn Avenue and Mozart Street.

(*Late News Continued on Page* 55)

New York's Newest Unification Proposal

Legislation to Be Recommended Under Which City Would Take B.M.T. and I.R.T. for $489,804,000. Public Board to Control

SAMUEL UNTERMYER, special counsel for the city of New York on rapid transit matters, submitted to the Transit Commission on Dec. 29 a comprehensive plan, including a definite financial set-up for absorption of outstanding Interborough and Brooklyn-Manhattan Transit Company securities. It is the third which Mr. Untermyer has submitted since he entered the situation as special counsel in 1927. It was formulated after previous efforts to reach a solution of the unification problem had met with opposition, first from the B.-M.T., next from the Interborough and finally from the Republican majority in the Senate at Albany, which killed unification bills previously.

The latest unification plan represents a negotiated settlement instead of one brought about by force. The B.-M.T. is not to be dismembered but made the very core of the new unity, with its expert operating chiefs under contract to manage the whole enterprise. The Interborough is not to be subjected to the rigors of recapture either, save as a last resort. Its new directors have participated in the conferences, and are apparently prepared to accept the outcome. As the New York *Times* points out, unification is to be complete, not partial. Nothing more is heard of the referendum on the 5-cent fare. The provision in the enabling legislation authorizing the city to make up operating deficits out of taxes has been stricken out. Finally, and most significant of all, virtual agreement has been reached as to price.

The price Mr. Untermyer is ready to offer the B.-M.T., only part of which is to be paid in cash or corporate stock, is $213,300,000; for the Interborough,

(*Continued on Page* 57)

Pageant of Street Railway Progress at Detroit

One of the new cars recently delivered to the Detroit Municipal Railway will be placed on display on Jan. 3 on Fort Street adjacent to the City Hall. On the same rails a Timken truck will be available for close inspection by the public. On Jan. 8 there will be a parade of street cars down Woodward Avenue, lead by an original Detroit horse car, renovated and repaired after 30 years in service as a cobbler's shop. Following this car will be others identified and dated as follows:

"The Ponchartrain," 1895.
"The Pingree Three-Cent Car," 1898.
"The First Modern Double Truck," 1904.
"The Bowling Alley," 1908.
"The First Pay As You Enter," 1912.
"The Hobble Skirt Trailer," 1915.
"The Safety Car," 1920.
"The Peter Witt," 1922.

Eight or ten of the new cars, equipped with the new Timken trucks.

A float bearing one of the new trucks, labeled, "Worm Driven Street Car Truck." "A New Industry for Detroit."

At the City Hall, Mayor Murphy will address the citizens on the progress of street railway service in Detroit. He will honor a group of railway men who have been in the service in Detroit for more than 35 years.

At the conclusion of his address, the Mayor will mount the leading new car and take the controls, with the street railway commission, the Common Council and visitors as his passengers. Veteran motormen and conductors will man the remaining cars and start them off on their new routes.

A parallel pageant exhibiting the progress in buses in use in Detroit will accompany the street car parade.

Del A. Smith, general manager of the railway, will speak over a Detroit radio station on the preceding night, Jan. 7.

Prominent visitors will be guests of the Timken-Detroit Axle Company at a dinner the night of Jan. 8.

Detroit's own horse car will be placed on display next to the modern car on Fort Street the afternoon of Jan. 8 and left there through Jan. 10.

Coming Meetings

Jan. 8—Society of Automotive Engineers, annual dinner, Hotel Pennsylvania, New York, N. Y.

Jan. 19—Society of Automotive Engineers, annual meeting, Book-Cadillac Hotel, Detroit, Mich.

Jan. 20—Institute of Traffic Engineers, Engineering Societies Building, New York, N. Y.

Jan. 28-30—Electric Railway Association of Equipment Men, Southern Properties, Patten Hotel, Chattanooga, Tenn.

Jan. 29-30—Central Electric Railway Association, Claypool Hotel, Indianapolis, Ind.

Jan. 29-30—Central Electric Railway Accountants Association, South Bend, Ind.

March 10-12—Oklahoma Utilities Association, Oklahoma City.

March 12-13—Annual Convention, Illinois Electric Railway Association, Springfield, Ill.

April 8-9—Central Electric Railway Master Mechanics Association, Hotel Secor, Toledo, Ohio.

April 16-18—Annual State Convention, Missouri Association of Public Utilities, Excelsior, Mo.

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City N. J.

LATE NEWS

(Continued from Page 54)

Camden, N. J.—The City Commission on Dec. 29 granted permission to the Public Service Co-ordinated Transport to substitute buses for trolley lines between Camden and Trenton. Two routes are planned, one from Federal Street Ferry to Westfield Avenue over Federal Street, and the other on Market Street to River Road, Seventh and State Streets, thence northward.

✦

Chicago, Ill.—The Chicago surface and elevated lines asked the City Council on Jan. 2 for an extension of time from Jan. 31 to May 22 in which to accept the indeterminate franchise ordinance approved by the voters July 1 last. The application was referred to the committee on local transportation, which will meet Jan. 9.

✦

St. Louis, Mo.—The Aldermen have passed and the Mayor has signed an ordinance establishing safety zones for the protection of street car passengers. The measure bore an emergency clause putting it into effect when signed by the Mayor. The new ordinance permits the street department to establish safety zones at every intersection where there are street car stops. Opponents of the measure contended that the bill is an unlawful delegation of aldermanic powers to the department of streets and sewers.

✦

Washington, D. C.—Abandonment of the Mount Vernon, Alexandria & Washington Railway, and substitution of buses was considered at a conference on Dec. 28.

✦

Baltimore, Md.—Twelve improvement associations said to represent 200,000 persons have combined in an effort to have the United Railways & Electric Company establish a bus line connecting Northeast Baltimore with the Highlandtown section. Lucius S. Storrs, president of the United, said the request would be studied thoroughly.

✦

Worcester, Mass.—Receivership for the Worcester Consolidated Street Railway became an actuality on Dec. 31 when Judge Lowell in the United States District Court in Boston appointed Clark V. Wood, president of the company, and Daniel W. Lincoln, referee in bankruptcy for Worcester County, as receivers.

✦

Cincinnati, Ohio—The new Fernbank Dam line of the Cincinnati Street Railway will be put into operation within a few days, thus ending a controversy of many years' standing as to adequate transportation facilities for this Cincinnati down-river suburb. The new stretch is 6.1 miles, the total distance from end to end of the line being 13.3 miles, making it the longest street car line in the community where only the city fare rate is charged. For the complete trip, the rate is approximately [illegible] cent a mile, whereas, to the end of another suburban line (for the purpose of comparison) a distance of 15.8 miles, the cost per mile is about 2 cents. The new service will be operated on a 30-minute schedule.

Political Rights of Public Utilities

"IT IS just as much the duty of corporations and public utilities to see that proper men are elected to public office as it is the duty of the individual citizen. A reasonable activity on the part of utilities in informing the public of issues before it which affect the public as well as the utility is to be commended rather than condemned."—E. W. Decoto *of California Railroad Commission.*

Richmond, Va.—The Roanoke Railway & Electric Company has been authorized by the State Corporation Commission to take up its tracks in Salem and over the route between Salem and Washington Heights and to substitute service by bus. The order covers approximately 4.8 miles of trackage.

✦

Philadelphia, Pa.—Judge McDevitt, head of the Transit Conference, which is studying the plan under which it is proposed the city shall acquire the properties of the Philadelphia Rapid Transit Company, has intimated there are strong indications that a price not far from $150,000,000 for the entire system will be finally proposed as the desirable one for the city to pay if the total acquisition plan is to be adopted. The valuation of the system for rate-making purposes has been fixed by the Public Service Commission and the courts at "upward of $200,000,000."

✦

Erie, Pa.—Railway service between Erie and Wesleyville will be discontinued on Jan. 10 by the Erie Railways. On that date the company's bus operating subsidiary, the Erie Coach Company, will establish bus service over the 7-mile route. New equipment has been ordered in anticipation of the change in service.

The Business Outlook

BUSINESS sentiment is steadier and more alert as the year closes and the railroad consolidation news strikes a constructive note to start the new year. Building contracts, merchandise carloadings, steel production and check payments have held out surprisingly well. Basic commodity prices seem to have exhausted the possibilities of further decline. Though the tangible effects of lowered Federal Reserve rediscount rates on the bond market are still to be tested, increasing support may be expected if the usual contraction of outstanding Reserve credit is not insisted upon when the large volume of currency in circulation returns to the banks in January. It is still difficult to see very far into 1931, but the atmosphere is slowly clearing.
—*The Business Week.*

St. Louis, Mo.—The St. Louis Public Service Company has protested a tax bill of $971,833 rendered by Collector Koeln. The company tendered $758,536, but the payment was refused. The company holds that it has been over assessed by the State Board of Equalization in comparison with similar companies in other cities of the state. The company pays taxes on an assessment of $44,258,000. The company desires to have the assessment reviewed by the courts.

✦

New York, N. Y.—W. H. Onken, Jr., long connected with the McGraw-Hill Publishing Company, Inc., and formerly editor of *Electrical World,* has been elected vice-president of the Security Owners Association, organized in 1917 as the National Association of Owners of Railroad and Public Utility Securities, Inc., to protect the interest of investors. The headquarters of the association are in New York. Mr. Onken is an engineer by professional training who early turned to journalism as an outlet for his talents, but he has for many years been in contact with problems of finance as a result of his wide personal acquaintanceship, and his intimate knowledge of the technical expansion of business, particularly public utility expansion, presaged as it always is on the securing of capital necessary to convert plans into achievement.

✦

Pasadena, Cal.—The date of the hearing here on the application of the Pacific Electric Railway to establish a zone system of fares and to reroute motor coaches has been changed by the Railroad Commission from Jan. 27 to Jan. 28.

✦

Lincoln, Neb.—Contending that the state has full authority to control the use of its highways and may, therefore, make any reasonable regulations, including requirement that transportation companies must give surety bonds or take out liability insurance policies to protect passengers, the State Railway Commission has asked the Supreme Court to uphold the constitutionality of the law recently enacted requiring taxicab companies to give such protection. The law is being attacked on the grounds that the commission is authorized thereby to exercise both legislative and judicial power, resulting in taking of property without due process and denying equal protection under the law.

✦

Cleveland, Ohio—C. J. Mayers, receiver for the Cleveland Southwestern Railway & Light Company, has asked the federal court at Cleveland for permission to abandon the railway service. A hearing will be held in federal court at Cleveland on Jan. 23.

✦

New York, N. Y.—In the September-October issue of the *Military Engineer,* appeared an article, "A Survey of Railway Rolling Stock," by Walter C. Sanders, major specialist reserve, U. S. Army, and general manager of railway division, Timken Roller Bearing Company. The article gives much detailed information concerning developments in rolling stock design as well as comprehensive statistics on this subject. Reprints can be had without cost on application to the Timken Company.

El Paso's Model Kitchen on Wheels

Kitchen Utensils Demonstrated by Display Street Car

The Electric Range Special, a street car on which passengers are served with meals as they ride, is now in regular operation on the various lines in El Paso, Texas. This unusual publicity stunt places the El Paso Electric Company still more firmly in the vanguard when it comes to novelty in advertising. Seats were removed to permit the installation of an electric range, water heater, Kelvinator and kitchen table in one end of the car. A motor generator with resistance placed under the car, reduces the high voltage from the trolley wire for use in the kitchen. Passengers pay the customary fare and dine as they ride.

This rolling kitchen has been painted white inside and out. Attractive slogans appear in the car, advertising the fact that one can heat water and cook electrically for the low rate of 2 cents a kw.-hr. Suitable signs are used effectively on the outside of the car and on the dashboards.

The use of this novel rolling kitchen has aroused widespread public interest in the drive of the company to increase electric range and water heater sales. On the initial trip of the car, city aldermen, representatives from the chamber of commerce, the daily newspaper and leading department stores, were special luncheon guests of President F. J. Gannon and other company officials. The car made one of its scheduled trips while luncheon was prepared and served.

The Model Kitchen on Wheels has since Aug. 22 been making regular trips daily, except Saturday and Sunday, over various city lines in El Paso. Informative advertisements run in the daily newspapers, give schedule and routing from day to day, and patrons are invited to board the Electric Range Special when convenient. The car is operated by a special motorman, dressed in white. The daily menu is prepared by a smiling, competent home economist of the company, who is assisted in serving by a French maid.

The El Paso Electric Company is very wisely stressing the economical features of a completely electrified kitchen, including refrigeration. The company is pointing out to its customers that by making full use of electric service in the home, they may enjoy its many advantages at an exceptionally low rate.

The rolling kitchen was the subject of a talkie newsreel released by Universal in November. This issue devoted nearly 100 ft. to this feature which was displayed in motion picture theatres throughout the nation. Graham McNamee, famous Universal Newsreel talking reporter, was enthusiastic in praising the novelty of this idea. He said: "Well, here's the latest thing in street car service. Passengers dine as they ride. And it happened down in Texas." This was followed by a running fire of comment on the incidents depicted.

◆

Final Accounting in Indiana Receivership

The receivership of the Union Traction Company of Indiana was closed on Dec. 15 with the filing of a final report by Arthur W. Brady, receiver and former president. The court did not discharge the receiver, but set Jan. 2 as the date for a hearing. The report showed a summary of remaining assets to value $131,856, an amount held by the court to satisfy any claims or damage suits hereafter established.

The receiver reported that all properties had been delivered to B. P. Shearon and W. S. Gorman, representatives of the Midland United Company, on Aug. 1 and that they now were being operated by the Indiana Railroad, a subsidiary of the Midland United Company. Messrs. Shearon and Gorman paid $376,528 for the property at the receiver's sale, after having bought up bondholders' interest.

The former Union Traction Company system consisted of approximately 450 miles of interurban lines, prior to several abandonments during the past year, and city street car and bus lines in Anderson, Marion and Muncie.

◆

Work Progressing on Newark Railway

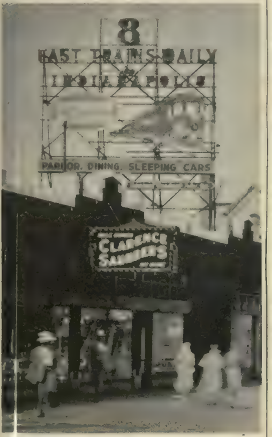
Conversion of the bed of the abandoned Morris Canal in Newark, N. J., into a right-of-way for electric railway operation continues steadily. The work is being done by the city. When completed, the City Railway, since that is the name by which the property will be known, will be operated by Public Service Co-ordinated Transport. The accompanying illustrations show one of the stations along the line and work under way at Lock and New Streets where the City Railway will emerge into the open for the first time after leaving its starting point at the Pennsylvania Railroad Station.

Photo by Newark Evening News

Work Progressing on Newark's New High Speed Line

Spectacular Advertising by Interurban

A spectacular sign advertising fast electric railway service between Louisville and Indianapolis has been erected for the Interstate Public Service Company at Fourth Street and Broadway in Louisville, Ky. The new sign is 18 ft. high and 22 ft. wide. It overlooks the principal street intersection in the hotel and business section. The copy reading "Eight Fast Trains Daily to Indianapolis" consists of red and green luminous tubing and channeled letters varying in height from 14 in. to 36 in. The front of the electric train "cut-out" has a genuine railway headlight which flashes on and off. The words "Parlor Dining Sleeping Cars" are painted on a panel 18 in. high and 22 ft. long. A 500-watt floodlight projector on the roof of an adjoining building is trained on the sign.



Floodlighted Sign Advertises Interurban Service

◆

277-Mile Interurban Run

The de luxe limited service of the Cincinnati & Lake Erie Railroad was extended to Detroit on Dec. 19. The cars will make two trips a day in each direction between Toledo and Detroit. The addition of the 57-mile stretch makes the run 277 miles. Between Toledo and Detroit cars operate over the lines of the Eastern Michigan Railways. Running time between Dayton and Detroit is approximately six hours and 45 minutes, while between Cincinnati and Detroit is is nine hours and five minutes.

◆

Profit Sharing Plan in Kansas City

Employees of the Kansas City Public Service Company, Kansas City, Mo., will receive one-fourth of the net earnings of the company, according to a plan adopted on Dec. 22 by directors. This profit sharing plan will be in addition to present wages. Two methods of distribution are offered for employees to choose from—one would make them security holders in the company, the other provides an outright cash distribution.

Under the security plan, employee participation certificates will be issued quarterly to represent the amount the employees have in trust. From the trust fund they will be permitted to withdraw holdings as sufficient participation certificates accumulate to permit distribution in even amounts. About 2,500 employees, all execpt higher officials, will participate.

◆

Steam and Electrics in Freight Affiliation in Texas

The Texas & Pacific, the Texas Electric Railway, the Cotton Belt and the Southern Pacific Railroads are all using the same local motor transport company, the Electric Freight Agency, in their freight pick-up and store-door delivery service. The door-to-door delivery service, originated by the Texas & Pacific, was the railroad's first stroke in its campaign to retrieve freight shipments lost to the motor trucks. Other lines followed suit. By this means the rail carrier calls at the shipper's door, picks up a shipment for, say, Waco, and after hauling it from Dallas to that point, then delivers the package to the consignee's door. The rate charged is identical with that prescribed by the Texas Railroad Commission for the regular motor truck line hauling the package the same distance.

Neither the railroads nor the interurbans in Dallas maintain their own trucks for the pick-up and delivery service, but contract in each town with a local trucking concern to perform this service. The Electric Freight Agency in Dallas is independent of any railroad or interurban and maintains its own fleet of trucks in Dallas.

According to T. E. Hoffman, general freight agent for the Texas & Pacific Motor Transport Company, the movement has passed definitely beyond the experimental stage.

New York Unification Proposal

(Continued from Page 54)

$276,504,000. Added to these figures are $700,000,000 as the estimated cost of the independent system, and $368,000,000 which the city has already invested in the old subways, a total of $1,558,000,000, exclusive of accrued interest.

Mr. Untermyer describes the undertaking as "the most stupendous of its kind in financial history." Under compulsion to persuade both sides that they are making a good bargain, he shrewdly draws a distinction between the value of the property to the companies and its value to the city: the B.-M.T., for example, may be getting $25,000,000 more than its property is worth judged by earnings, but several times that sum less than it is worth to the city under unification, free from the burdens of the dual contracts.

Only two minor items remain in dispute between counsel and the companies: damage claims and unpaid taxes, amounting in all to some $10,000,000, which Mr. Untermyer is unwilling to have the city assume. Apart from that, the "proposed tentative plan" is now ready, in all its details, for public discussion. The *Times* said:

> Even though the Transit Commission is chiefly concerned with the old lines, what the public wants to know is how the whole system may be expected to work, and with what drain, if any, on the public treasury. Earlier reports contained elaborate estimates on this subject: they should be brought up to date. It is not hard to demonstrate that unification may result in the successful operation of the old lines at a 5-cent fare, but the new lines are another matter.

Mr. Untermyer recommends that the enabling act be introduced at once, at Albany. He also urges immediate service of a copy of the proposed unification plan and the report on the Board of Estimate and the companies, together with notice of daily hearings to be held before the Transit Commission after 90 days. The commission may formally promulgate a plan after the hearings have closed. The Board of Estimate must then approve the plan before it can become operative. It must also be approved by the companies and by the required number of votes of various classes of security holders.

New York Morning "World's" Pictorial Recognition

In the opinion of the *Times*, the entry of the Interborough and the virtual agreement on price bring the negotiations within sight of the goal. That paper says:

> Unification on some such terms will mean so much to the city that it can afford to be liberal. It will mean, if the new lines are brought into the system, city-wide operation by one management at a single fare. It will mean, if Mr. Untermyer's calculations are correct, the eventual release of the "frozen credits" in the existing lines. The remaining preferentials will be canceled, the burden of the dual contracts eliminated, direct municipal operation of the independent subways avoided. The alternative is not to be contemplated with equanimity, and the city owes a great debt to Mr. Untermyer for what he has accomplished. His persistence, his mastery of the intricate details of the problem, his willingness to meet constructive criticism, his extraordinary skill in conducting the most difficult of negotiations, have all borne fruit. The plan may not be perfect in every detail, but it can be perfected. To that objective city and state authorities should now address themselves, grateful to the negotiators on both sides for their patience and good will.

Good Results Under Des Moines One-Man System

The operation of one-man cars in Des Moines, Iowa, introduced by the Des Moines Railway on July 4, 1930, has proved successful, according to Charles W. Gifford, vice-president and general manager. While the revenue of 1930 will fall approximately $200,000 below the 1929 figures, operation from a service standpoint has been up to expectations.

A set of ten facts have been set forth in connection with operation of one-man cars.

1. Operating expenses have been reduced $8,000 a month.

2. Trainmen now employed number 353 against 421 under two-man operation in July.

3. Of the 78 trainmen not given regular employment, 24 have voluntarily left the service.

4. The remaining 44 men retain seniority rights and are given work when demands of work require their service.

5. One hundred and thirty cars are now operated, against 108 prior to one-man operation, an increase of 21 per cent.

6. Forty new cars, costing $600,000, have been placed in service, and 40 25-year-old pieces of equipment withdrawn.

7. There are 543,492 car-miles traveled monthly now as against 447,398 formerly.

8. All lines have been retained, and two motor coach routes extended.

9. Operators now receive 66 cents an hour as against 58 cents formerly.

10. The accident rate has been reduced from 4.5 per cent to 3 per cent per 10,000 miles traveled.

The details of the physical rehabilitation of the Des Moines road were reviewed in the Journal for December, 1930.

What's in *News of the Industry*

Unification plan for New York announced.

Chicago Surface Lines men adopt shorter hours plan.

Pageant of progress at Detroit.

$150,000,000 offer for Philadelphia railways likely.

Business sentiment steadier.

Merchandising electrical devices by trolley car.

Receivership accounting in Indiana.

Converting canal bed for railway use in Newark.

Flashing sign advertises interurban.

From Dayton to Detroit by interurban.

Kansas City has profit-sharing plan.

Steam, electrics and trucks work together in Texas.

Enticing program for Tennessee meeting of equipment men.

J. P. Barnes to leave Louisville Railway.

Des Moines under the one-man system.

Conspectus of Indexes for January, 1931

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares*† 1913 = 4.84	Dec., 1930 **7.77**	Nov., 1930 **7.76**	Dec., 1929 **7.62**	Oct., 1930 **7.79**	Dec., 1925 **7.30**
Electric Railway Materials* 1913 = 100	Dec., 1930 **127.8**	Nov., 1930 **130.9**	Dec., 1929 **144.9**	Dec., 1926 **159.2**	Dec., 1930 **127.8**
Electric Railway Wages* 1913 = 100	Dec., 1930 **231.8**	Nov., 1930 **231.8**	Dec., 1929 **231.1**	Nov., 1930 **231.8**	Dec., 1925 **223.0**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Dec., 1930 **192.0**	Nov., 1930 **194.1**	Dec., 1929 **205.1**	Nov., 1928 **205.7**	Dec., 1930 **192.0**
General Construction Cost Eng'g News-Record 1913 = 100	Dec., 1930 **196.9**	Nov., 1930 **198.5**	Dec., 1929 **209.5**	Jan., 1927 **211.5**	Dec., 1930 **196.9**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Nov., 1930 **80.4**	Oct., 1930 **82.6**	Nov., 1929 **94.4**	Nov., 1925 **104.5**	Nov., 1930 **80.4**
Wholesale Commodities Bradstreet 1913 = 9.21	Dec., 1930 **9.84**	Nov., 1930 **10.06**	Dec., 1929 **12.24**	Dec., 1925 **14.41**	Dec., 1930 **9.84**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Nov., 1930 **141.4**	Oct., 1930 **144.4**	Nov., 1929 **159.7**	Nov., 1925 **167.1**	Nov., 1930 **141.4**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Oct., 1930 **151.9**	Sept., 1930 **152.9**	Oct., 1929 **163.4**	Nov., 1925 **171.8**	Aug., 1930 **151.6**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Nov., 1930 **105.4**	Oct., 1930 **103.2**	Nov., 1929 **122.9**	Feb., 1929 **140.4**	Dec., 1926 **101.7**
Bank Clearings Outside N. Y. City 1926 = 100	Nov., 1930 **76.1**	Oct., 1930 **81.5**	Nov., 1929 **111.2**	Oct., 1929 **111.8**	Nov., 1930 **76.1**
Business Failures Number Liabilities, Millions of Dollars	Nov., 1930 2000 **280.51**	Oct., 1930 1943 **74.19**	Nov., 1929 1529 **60.88**	Nov., 1930 2000 **280.51**	Sept., 1928 1348 **23.13**

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*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads. †Revised to 1930 Census. See explanation, Journal, December, 1930, page 756.

Well Rounded Program for Meeting of Southern Men

Details have been announced regarding the program of the meeting of the Electric Railway Association of Equipment Men, Southern Properties, to be held at the Patten Hotel, Chattanooga, Tenn., on Jan. 28, 29 and 30. The meeting will be called to order on Jan. 28 at 9:45 a.m. Following addresses of welcome by E. D. Bass, Mayor of Chattanooga, and E. D. Reed, district manager of the Tennessee Electric Power Company, and the conduct of routine business, the following addresses will be made at the morning session:

"Baltimore's New Car," by A. T. Clark, superintendent rolling stock and shops, United Railways & Electric Company, Baltimore, Md.

"Trolley Buses," by G. W. Wilson, engineer, General Electric Company, Erie, Pa.

"Increase in Street Car Speeds," by E. J. Jonas, superintendent equipment, Cincinnati Street Railway.

"Recent Improvement in Transportation Equipment for Moderate Size City Operation," by S. B. Cooper, manager railway engineering department, Westinghouse Electric & Manufacturing Company.

At the afternoon session, starting at 2 p.m., these addresses will be delivered:

"Specifications for Sheet and Structural Steel Car Construction," by H. M. Arrick, manager railway division, American Rolling Mill Company, Cincinnati, Ohio.

"Good Maintenance is Economical in Bus Operation," by R. A. Hauer, vice-president and manager, bus department of the Mack-International Motor Truck Corporation, New York City.

"Car Cleaning," by H. L. Turney, master mechanic of the Birmingham Electric Company, Birmingham, Ala.

"Painting of Street Cars," by J. T. Porter, superintendent of equipment of the Virginia Electric & Power Company, Richmond, Va.

"Prevention of Frozen Air in Brakes and Safety Appliances," by Joe Dapron, mechanical expert of the Westinghouse Traction Brake Company, St. Louis, Mo.

At this session the movie of Leeds, Tozzer & Company's automatic car washing machine will be shown.

The program of the business sessions on Jan. 29 will be taken up entirely with the discussion of questions submitted in the questionnaire. The banquet, followed by dancing, will be held in the evening at the Hotel Patten. The speaker will be Judge Nathan L. Bachman.

At the session at 9:30 a.m., on Jan. 30 officers will be elected. Starting at 11 a.m., the delegates will begin an inspection of the properties of the Tennessee Electric Power Company.

◆

Engineers to Inspect New York's Subways

Members and guests of the New York Section, Transportation Group, of the American Institute of Electrical Engineers, are to visit certain of the completed substations of the New York's new Eighth Avenue Subway on Jan. 9. Meeting at the Dyckman Street substation, 207th Street and Tenth Avenue, at 2 p.m., the members will be shown over the full automatic rotary converter substation installation, after which they will visit the adjoining car shops and inspect the new cars. Members and their guests are to dine at the Shorehan Restaurant in the Chanin Building, later attending the joint meeting of the power and the transportation groups.

PERSONAL MENTION

James P. Barnes to Leave Louisville Railway

Head of System Since 1920 Not to Stand for Re-election—His Record in Louisville Reviewed—F. H. Miller to Succeed Him

J. P. BARNES, president of the Louisville Railway, Louisville, Ky., since July 1, 1920, has informed the directors of the company of his determination not to stand for re-election as president or a director at the annual meeting on Feb. 18 because "the present dissention within the board of directors has produced a situation which is intolerable to me." Mr. Barnes feels that the company's legal and financial affairs have been brought to a stage which protects the interests of those who invited him to come to Louisville. He says it was pleasant to do this work under the conditions of harmony and co-operation which prevailed throughout the long uphill fight in the company's affairs, but which have only recently been disturbed. It is understood that the resignation of Mr. Barnes, effective as of Feb. 18, 1931, will carry with it the resignations of E. F. Kelley, assistant secretary, assistant treasurer and purchasing agent; F. E. Belleville, general auditor and secretary, and Mrs. A. L. Humphrey as treasurer.

When Mr. Barnes accepted the responsibilities of the presidency in July, 1920, the company was paying no common dividend, and was $306,250 in arrears on its cumulative preferred dividends. Since 1920 earnings have been sufficient to pay all operating expenses, taxes and interest and, in addition thereto, accrued and current dividends on the preferred stock, amounting to $2,012,500. During the same period the earnings were in addition sufficient to pay $7 per share in dividends on common stock, amounting to $582,652. The total dividend payments amounted to $2,595,152. From the earnings in the ten years—1920 to 1929—$1,750,000 were carried into depreciation reserves. One hundred and twenty new street cars and 47 new buses have been placed in the service. Nearly 33 miles of bus route have been added. A deficit of $458,020 at the end of Dec. 31, 1920, was converted to a surplus of $1,005,327 as of Dec. 31, 1929. Moreover, the physical condition of the company's various properties has been continuously improved. Up to Oct. 31, 1930, all operating expenses, taxes, interest, preferred dividend requirements had been earned and in addition, $161,075, or $1.94 per share was available for the common stock.

The improvement in the company's legal position is summarized in the statement that, in addition to owning the only bus franchise in Louisville, it is no longer in danger of suffering from an enforceable 5 cent contractual fare, but is entitled to a fare which will yield a reasonable return on the value of its property, and the value of its city properties as judicially determined for the purpose of preliminary injunction now in effect is in excess of its capitalization of city properties. Moreover, an attack on the company's franchise has been defended, and an opinion obtained from the Court of Appeals upholding the legality of the present regulatory ordinances. Jitneys have been eliminated.

J. P. Barnes

Faced with the need of arranging for a refunding operation, the company sold its power plant and appurtenances for $3,000,000 cash, used to pay one-half of its first mortgage maturing on July 1, 1930, and entered into an advantageous contract for the purchase of its power. The other $3,000,000 of the first mortgage bonds have

(*Continued on Page* 60)

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Railway Man in Civic Post

D. W. Pontius, president of the Pacific Electric Railway, Los Angeles, Cal., has been appointed comptroller of the Metropolitan Water District of Southern California, by unanimous vote of the board of directors of the district, composed of a number of communities in southern California acting together to construct the great Colorado River aqueduct to bring a domestic water supply to the member cities. Mr. Pontius has stated that he would be ready to serve until construction of the aqueduct was well under way, when, in his opinion, the district should have a salaried comptroller who would give all of his time to the duties of the office. Mr. Pontius is serving without salary.

K. H. Campbell Advanced by Indiana Companies

Kenneth H. Campbell, formerly secretary of statistics and records in the gas engineering department of the Northern Indiana Public Service Company, Fort Wayne, Ind., has been appointed employment manager of the Interstate Public Service Company, Indiana Service Corporation, Northern Indiana Public Service Company and other co-ordinated utilities in Indiana under Midland United Company control.

Mr. Campbell entered the employ of the Northern Indiana Public Service Company at Fort Wayne as a bookkeeper immediately following his graduation from Indiana University in 1926. He subsequently held the positions of statistical clerk in the general accounting department and of assistant to the chief accountant for the southern region of the company. In his new post he succeeds the late Lowell H. Miles.

◆

J. A. Noertker an A.I.E.E. Prize Winner

J. A. Noertker, of the engineering department of the Cincinnati Street Railway, Cincinnati, Ohio, and H. F. L. J. Seyler of the Consolidated Gas, Electric Light & Power Company, Baltimore, are winners respectively of the best paper prize and the initial paper prize awards of the American Institute of Electrical Engineers for the year 1929. Mr. Noertker's paper was entitled "Street Railway Power Economics on the Cincinnati System." Mr. Noertker is a native of Cincinnati. He was graduated from the University of Cincinnati in 1923. He entered the employ of the Cincinnati Traction Company as a co-operative student, and after graduation remained with the company in the capacity of "special engineer." In 1927 he was promoted to the position of electrical engineer of the Cincinnati Street Railway, successor to the Cincinnati Traction Company.

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C. E. Allen Commercial Vice-President for Westinghouse

Claxton E. Allen, formerly manager of the Southwestern district of the Westinghouse Electric & Manufacturing Company, has been elected a commercial vice-president of that company, reporting to W. S. Rugg, vice-president in charge of sales.

Mr. Allen's duties of co-ordination will extend over the domestic appliance division and other divisions serving the household market, such as refrigeration, radio, etc., and also the jobbing outlets, and other outlets as may be appropriately developed.

Mr. Allen has been associated with the Westinghouse company since 1909. He is a native of Virginia. He was graduated with the degree of Bachelor of Science in electrical engineering from the Virginia Polytechnic Institute in 1901. His first position with Westinghouse was as head of the transformer division of the detail and supply department. Three years later he was appointed assistant to manager of that department. For a short time in 1915 he was attached to the sales department of the New York district office and then was made manager of the supply division and central station division of the Chicago office, which position he held until 1922, when he was appointed manager of the St. Louis district office.

Charles G. Adsit Becomes President at Des Moines

Charles G. Adsit, for several years with the Georgia Power Company and associated with many engineering developments of major importance in this country and Mexico, is now president of the Des Moines Railway and the owner, with Walter J. Cummings, of the system. He also is vice-president of the Des Moines & Central Iowa Railroad and vice-president of the Chicago & West Towns Railway.

C. G. Adsit

Mr. Adsit was born at Ironton, Ohio, on Nov. 1, 1874. There he spent his early days. He became interested in electrical work in his latter high school days when he assisted in the construction and operation of one of the first alternating-current lighting systems in the country. In 1892 his family moved to Chicago, where he finished high school and entered the University of Chicago. He became connected, at this time, with John R. Allen, then engaged in engineering and electrical work for the World's Fair in Chicago. After serving with Mr. Allen during his school term, he journeyed with a mining party to Alaska in 1898. On returning, he became a member of a firm of contracting engineers in Chicago which was installing lighting systems throughout the Middle West.

In 1900 Mr. Adsit entered the technical course with the General Electric Company at Schenectady where during the latter part of a term of three years he enjoyed the unusual opportunity of being associated with Charles P. Steinmetz. While with the General Electric Company, Mr. Adsit conducted experiments on three-phase alternating current for electric railway use and developed experimental substations on the Schenectady, Troy & Albany Railroad.

He became associated in 1903 with George H. Evans, then the most prominent hydraulic engineer on the Pacific Coast, and was stationed in Colorado as Mr. Evans' assistant in all hydraulic, electrical and other engineering matters. During this period he supervised the construction of several hydro-electric developments, including those at Breckenridge, Dillon and Fairplay, Col. He next became engineer in charge of a hydro-electric development on the Bear River in Montana, and assisted the Butte Electric & Power Company. On the completion of this work he was employed by parties in Denver to investigate water powers in New Mexico. In 1906 he became consulting engineer on power work for the Black Mountain Mining Company, then one of the largest mining interests in Mexico. He was connected with this concern until 1909. During this period he also was consulting engineer of the Warren-Bisbee Railway, the Warren Company, of Bisbee, and the Calumet & Arizona Mining Company. In addition to these duties, he served as consulting engineer for the territory of Arizona, all hydro-electric projects and bridge work coming under his jurisdiction.

In 1910 Mr. Adsit accepted a position with the Georgia Power Company, taking charge of the hydro-electric work planned by the company in September, 1911. He continued as vice-president and executive engineer of the Georgia Power Company until 1926. During this period he had charge of the construction of eight large hydro-electric plants, ranging in capacity from 25,000 to 100,000 hp. He also played an important part in developing the double-polarity feeder system, using 1,200 volts. In 1923 he assisted the Bell Laboratories in the development of carrier current telephony on transmission lines.

Up to the time Mr. Adsit joined the Des Moines Railway he constructed more than twenty different power developments in the United States and Mexico. He is a member of the American Institute of Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Franklin Institute. He also belongs to numerous other clubs and societies.

Ezra Brainerd Becomes Chairman of I.C.C.

Pursuant to its policy of rotation, the Interstate Commerce Commission on Dec. 11 announced Commissioner Ezra Brainerd, Jr., as chairman for the coming year. He succeeds Commissioner McManamy.

President Coolidge appointed Mr. Brainerd to the commission in 1927, prior to which he had been engaged for nearly 23 years in the general practice of law in Muskogee, Okla., where he settled in 1904 following his graduation from the University of Michigan.

J. P. Barnes Leaves Louisville

(*Continued from Page* 59)

F. H. Miller

been refunded on terms considered exceptionally favorable under the circumstances.

Another major accomplishment during Mr. Barnes' term of office was recognition by the city in 1922 of its obligation to regulate service and adoption of the so-called barometer fund plan, under which the railway operated until 1926, when the city undertook the determination of a rate base value of the company's property, and of a rate of fare sufficient to yield a reasonable return on that value. Under the terms of the 1926 ordinance, the Federal Court in 1929 approved a fare of 10 cents cash, three tickets for 25 cents, and school tickets at half price, rates now in effect.

This is in part the picture of accomplishments on the material side. Notable work has also been done on the human relations side. During the last decade, the company has won nation-wide commendation for the safety of its operation, and has three times received awards from the American Museum of Safety; for 1926 the highly coveted Anthony N. Brady gold medal, and for 1927 and 1928 honorable mention in the competition for the medal.

The career of Mr. Barnes in the electric railway industry and in association work, notably as president of the American Electric Railway Association and in sectional associations, is too well known to need repeating in detail. The work done under his stewardship in Louisville has just been summarized. Suffice it to say that his terms of service, following his work at Syracuse University and his graduation from the Massachusetts Institute of Technology have included engineering or managerial offices with the Oneida Railway, the West Shore Railroad, the Syracuse Rapid Transit Railway, the Syracuse & Suburban Railroad, the Buffalo, Lockport & Rochester Railway and the Schenectady Railway, from which last-named company he resigned to go to Louisville.

Frank H. Miller, vice-president, has been selected to become president of the company, his term to start on expiration of Mr. Barnes' term on Feb. 18.

Mr. Miller has been closely identified with the work of the president. When, in the early part of 1925, the title of general manager was conferred upon Mr. Miller, the first official of the company to be so designated, it must have made him reminiscent of a day 33 years ago when he started in the car repair shop of the company, and successively occupied the positions of timekeeper, storeroom man, car tester, truck repair man, assistant shop superintendent, superintendent of wire work, and superintendent of power stations. When Mr. Barnes took over the presidency of the Louisville Railway, Mr. Miller became vice-president in charge of engineering and maintenance, and in 1925 was made vice-president and general manager. He was graduated from Rose Polytechnic Institute in 1895, and afterward, through post-graduate work at Rose, took the degree of electrical engineer and later mechanical engineer.

D. A. Scanlon Retires at Akron

Daniel A. Scanlon, general superintendent of Akron Transportation Company, Canton, Traction Company, Northern Ohio Interurban Company and Cleveland-Akron-Canton Bus Company, has resigned effective on Jan. 1. He will remain as a director in the Akron company. Mr. Scanlon has been associated with these companies and their predecessors, for 24 years, eleven of which he has been general superintendent of railways.

"I have no plans for the immediate future," he said, "except that I am going to take a long vacation and much needed rest. I feel that I have been in the game long enough. I fully believe those who take charge of the transportation business in this vicinity will do all they can, as I have tried to do, to give the people good service."

Mr. Scanlon expects to go to Hot Springs, Ark., for several months for complete rest. While there he thinks he may play some golf, but he says he will forget business.

"Dan" Scanlon, as he is generally known, began work for the old Canton Traction Company at the beginning of 1906 as master mechanic in the Canton shops. Four years later he was put in charge of the Canton Traction Company, Northern Ohio urban division. Ten years later he was made general superintendent of the entire system, including city and interurban lines and moved from Canton to Akron.

D. A. Scanlon

Mr. Scanlon was born in Portland, Me. Early in life he started to work in the shops of the Portland Railway. He never left the public utility business, going from Portland to Newark, Ohio, as superintendent of equipment for the Columbus, Buckeye Lake & Newark Interurban Company. From Newark he was transferred to Raleigh, N. C., and placed in charge of the shops of the Raleigh Electric Company. From Raleigh he went to Canton.

◆

Several Changes in Detroit Personnel

Fred L. Vanderveer has resigned as claims attorney for the Department of Street Railways, at Detroit, Mich., having asked to be relieved so he could devote his time to his private practice. Mr. Vanderveer, an appointee of former Mayor Bowles, is succeeded by Raymond J. Kelly, past commander of the Department of Michigan American Legion.

Harold Kuder, personal secretary to General Manager Del A. Smith, has been appointed by the Street Railway Commission to succeed William L. Calnon as secretary to the commission.

In Mr. Vanderveer's letter to the commission, he stated that the claims department workers were "grossly underpaid, especially the attorneys," and suggested that immediate salary increases be granted. He further suggested settlement of several pending cases in which the D.S.R. liability seems to be clear, to avoid "catastrophe judgments."

Mr. Kelly's title has been changed to that of general attorney for the department.

Fred Nolan, formerly assistant to the general manager, has been promoted to the position of chief auditor for the department.

OBITUARY

E. G. Connette

Edward G. Connette, prominent in the public utilities field in New York City and elsewhere for the last 30 years, died on Dec. 30 at the home of his son, Thomas W. Connette, in Lockport, N. Y., whither he had gone for the Christmas holiday.

Mr. Connette was a former president of the International Railway and of the United Gas & Electric Company, of New York. More recently he had been connected with the Associated Gas & Electric Company, New York.

Mr. Connette was born in Austin, Ind., on Dec. 29, 1864. Three years later his father died. At thirteen, he went to work doing odd jobs in the local railroad station at Austin. In eighteen months he had qualified as a telegraph operator and subsequently was so employed at the general office of the Louisville, Cincinnati & Lexington Railroad at Louisville, Ky.

Mr. Connette was later transferred to the office of the company's general superintendent, and when the road was purchased by the Louisville & Nashville Railroad he was put in the engineering department. In two years he became chief clerk of the Henderson Division of the company, with headquarters at Henderson, Ky.

Mr. Connette next served as assistant to the superintendent at Nashville, Tenn., and in 1900, when the street railways in Nashville were merged, he became superintendent of the consolidated companies. One year later he was general manager and in 1897 he was made chief engineer of the Cumberland Electric Light & Power Company in addition to being railway manager.

From 1900 to 1905 Mr. Connette was vice-president of the Syracuse Rapid Transit Company and in the latter year he became general manager of the Worcester Consolidated Street Railway, Worcester, Mass., and its subsidiary companies. In 1909 he became transportation engineer for the Public Service Commission for the First District of New York with jurisdiction in New York City, but in 1912 resigned that post to become associated with the International Railway Buffalo, leaving it in 1915 to join the electric companies with which he was thereafter associated.

For years Mr. Connette was active in the affairs of the American Electric Railway Association and its predecessors, having been its third vice-president in 1897-98. He was president of the Street Railway Association of the State of New York in 1903-4.

◆

Luke Grant

Luke Grant, publicity manager of the Chicago Rapid Transit Company, died suddenly on Dec. 2 at Stuart, Fla., whither he had gone two weeks before at the suggestion of his doctor.

Since his earliest days as a carpenter, Mr. Grant had been interested in affairs of labor. He held numerous positions in labor organizations in the city of Chicago.

Luke Grant

He was a close friend and confidante of the late Samuel Gompers, president of the American Federation of Labor; and likewise an intimate of Prof. John R. Commons, eminent labor authority.

After leaving newspaper and government work in 1917, he took the position he held at the time of his death—publicity manager of the Chicago, North Shore & Milwaukee Railroad and the Chicago Rapid Transit Lines.

Born in Glenlivet, Scotland, on June 23, 1868, Mr. Grant came to the United States in 1890, and found work as a carpenter. In keeping with journalistic inclinations he soon obtained a job with a newspaper, and then with a few years of experience behind him was appointed labor editor of the old Chicago *Inter-Ocean*. Then followed twenty years of newspaper work during which time he also served on the editorial staff of the Chicago *Record-Herald*. He also acted in the capacity of chief investigator for the government committee on industrial relations.

Until a few weeks before failing health called him to Florida, Mr. Grant was an active member and vice-president of the St. Andrews Society.

Luke Grant was kindly, courteous and considerate. His power of discernment had been quickened by wide human contact. He was among the first of the men in the utility field to serve in the capacity he did. And he accredited himself well not only for his company, but among those with whom his official duties brought him in contact. ELECTRIC RAILWAY JOURNAL is indebted to him, among many other things, for his inimitable contributions over a series of years to the dailies which it published at the annual conventions, for which he volunteered his service in the role of reporter at large among his many acquaintances, particularly operating officials of the Central West.

Prices of Many Basic Commodities Reached Low Level in 1930

The steadiness of price levels which had characterized most recent years was broken by very considerable declines during the last fiscal year. For the year as a whole, the wholesale price index of the Department of Labor averaged 91.9 as compared with 96.7 for the previous year, a decline of about 5 per cent. The decline in wholesale prices began during October, 1929, the index for September being only insignificantly lower than the peak for July. Between September, 1929, and June, 1930, the general index fell almost 11 per cent and the decline continued in July, although no further job occurred in August or September. The reduction in prices was much less precipitous than that which occurred in 1921. Although it took place during a shorter period of time, the total amount of the drop was but little greater than that which occurred in 1923-1924.

All three of the great groups of commodities were affected by the decline in prices. Except farm and food products, the index for all other commodities, consisting chiefly of manufactured goods and minerals, had remained substantially unchanged from April, 1927, to October, 1929. From October, 1929, until June, 1930, this group fell about 7½ per cent. All of the eight classes of non-agricultural commodities set forth in the statistics of the Department of Labor have declined in price; change has been particularly conspicuous in the textile, metal, and miscellaneous classes, the last mentioned of these largely dominated by rubber which has shown a very rapid drop in price.

Retail prices normally show less variability than wholesale prices. For the fiscal year 1929-30, as a whole, the cost of living index compiled by the National Industrial Conference Board averaged slightly lower than for the preceding fiscal year. The index scarcely began to fall before December, and the total decline between November and June was about 5 per cent.

Reduced consumption, excessive stocks and low prices characterized the non-ferrous metals during the past year. Copper occupied the spotlight because of its extremely wide range of price fluctuations. Earlier in the year an attempt was made to stabilize the price at 18 cents. This price was quoted by all sellers for several months. As consumption dwindled, many of the producers curtailed mine production, but many others continued at capacity. Stocks of the metal mounted rapidly. The price was suddenly reduced to 14 cents on April 15, 1930, and subsequently declined to as low as 9½ cents in October and November. When this low point was reached, representatives of about 90 per cent of world copper production assembled at a conference, and it was decided to curtail production, in order to prevent further accumulations of stocks.

The zinc and tin industries suffered from continued increases in stocks, accompanied by prices receding to figures at or below the cost of production for many companies. Aluminum and lead also showed price declines for the year averaging about 4 and 8 per cent, respectively.

Practically all material purchased by electric railways showed sharp declines in prices during the year 1930. The exceptions were cement and gravel, which rose in price about 1 and 2 per cent, respectively. A sharp decline occurred in crude rubber, structural steel, paint material, lumber and petroleum products. Somewhat smaller declines were made in anthracite, bituminous, coke, fuel oil, gasoline, brick, sand and tires.

TRADE NOTES

Westinghouse Electric & Manufacturing Company has recently made three changes in personnel at the Nuttall works. P. I. Philips, formerly superintendent of metal stamping, has been appointed works manager succeeding A. H. Houston, who resigned. W. H. Himes was promoted to manager of the engineering department. His appointment followed the resignation of L. M. Burnham. The final appointment was that of L. R. Botsai as gearing apparatus manager, succeeding E. E. Boon, who resigned.

◆

Ohio Electric Manufacturing Company, Cleveland, Ohio, announces the appointment of Roland N. Jessop as assistant sales manager, made effective Jan. 1, 1931.

◆

Electric Service Supplies Company announces that R. S. Keeler has joined the sales department of this company with headquarters in Chicago. Mr. Keeler was formerly with the Indiana Belt Line Railways and the Northern Indiana Public Service Company. He will cover portions of Indiana and southern Michigan.

◆

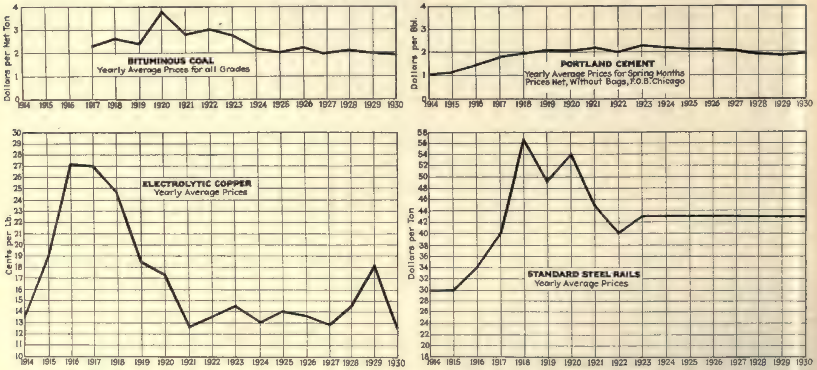
Weber Electric Company, Schenectady, N. Y., will consolidate its manufacturing and selling activities, the latter having been carried on for the past 30 years by Henry B. Sears as general sales agent. Mr. Sears will become vice-president of the Weber Electric Company, in charge of sales, and Frank V. Burton will continue as sales manager. Both will be located at the company's general offices at Schenectady.

◆

E. I. du Pont de Nemours & Company announces that the general office, A. E. Pratt, manager, and the eastern office, S. H. Crawford, manager, of the transportation sales department will be moved from Parlin, N. J., to Philadelphia. This department handles the sale of Duco, Du Lux and paint and varnish products to steam roads, electric railways and the marine industry.

◆

Elmer J. Lang, formerly president of the Lang Body Company and long associated with the bus industry, has been appointed by the A.C.F. Motors Company as district representative covering Ohio and adjacent sections in West Virginia and western Pennsylvania.



Trend of yearly prices of four basic materials used by electric railways

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Patron comments in actual service are just as favorable and enthusiastic as those of operating organizations.

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Right. Interior view, seating capacity for 16. De Luxe seats for Parlor Coach work.

Above. City service type interior. Baggage lofts omitted for this service.

1,100,000 bus miles per month

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It is a service of frequent stopping and starting on city streets, mostly in heavy traffic, and the average number of stops per mile is 8.6. This means a steady strain of starting and stopping—a test of Goodyear All-Weather Tread traction as well as the inner stamina of Supertwist Cord.

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THE GREATEST NAME IN RUBBER

GOODYEAR

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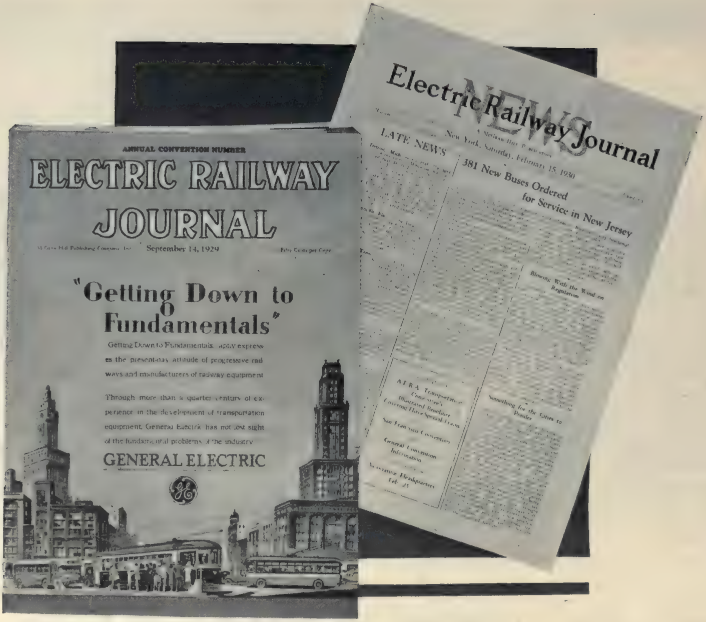

ANNUAL CONVENTION NUMBER

ELECTRIC RAILWAY JOURNAL

September 14, 1929

"Getting Down to Fundamentals"

Getting Down to Fundamentals aptly expresses the present-day attitude of progressive railways and manufacturers of railway equipment

Through more than a quarter century of experience in the development of transportation equipment, General Electric has not lost sight of the fundamental problems of the industry

GENERAL ELECTRIC

Electric Railway Journal NEWS

New York, Saturday, February 15, 1930

LATE NEWS

381 New Buses Ordered for Service in New Jersey

Blowing With the Wind on Regulation

A.E.R.A. Transportation Committee's Illustrated Brochure Covering Three Special Trains

San Francisco Convention

General Convention Information

Association Headquarters Feb. 25

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10th Ave. at 36th St., New York

Check one:

☐ Enter my subscription to the Electric Railway Journal NEWS and send me a bill for $2. (Foreign rate: $4 year).

☐ Enter my subscription to both the Electric Railway Journal monthly magazine and the separate NEWS service. Bill me for $5.

RALPH STARR BUTLER

Vice President in charge of Advertising

General Foods Corporation

"I cannot believe that the present enormous budgets would have been voted by responsible business men without such a measuring stick as the A. B. C. provides. Its foundation marks the turning point in advertising."

PHIL L. THOMSON

Director of Public Relations

Western Electric Company

"Business would never have spent millions to buy circulation by the pile. Accustomed to purchase copper, lumber or lead by an accepted unit of measure, we asked the same type of yardstick for space. The A. B. C. gave it to us."

P. L. Thomson.

●

Advertisers, men who direct the budgets of great companies . . .

Men who spend money for space in order to promote more profitable business . . .

Looking back over the active decades, they search out the turning point in American Advertising, the period when the confidence of business was won.

Independently, they agree on time and place.

It was the discovery of the Yardstick . . . The finding of a unit of measure for the value of advertising space. A unit as positive, as reliable, as the measure for coal or wheat.

* * *

Sixteen years ago a group of advertisers met with publishers and agencies in Chicago. To bring order out of chaos in circulation claims, they founded, on May 20, 1914, the Audit Bureau of Circulations.

In 1914, publication advertising totalled about $250,000,000. In 1927, year of the latest government report, it had reached over a billion dollars.

That this growth could not have come without the A. B. C. is the judgment of advertisers themselves.

Founded at the instance of advertisers, having advertisers in the majority on its Board of Directors, the A. B. C. exists to safeguard the interests of advertisers.

For them, it forms the bulwark against the chaos that once was advertising. It has enabled them to buy advertising with confidence.

In recognition of this service, an increasing number of leading advertisers hold membership today in the Audit Bureau of Circulations.

●

An Advertisement by

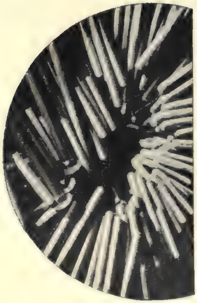
AUDIT BUREAU OF CIRCULATIONS

Executive Offices . . . Chicago

EXACTNESS in our methods is essential to serve the needs of our customers. From raw material to finished product, we take nothing for granted. The first step is a check for size—the last examination covers size, strength, fit, finish.

BOLTS
EMPIRE
NUTS-RIVETS

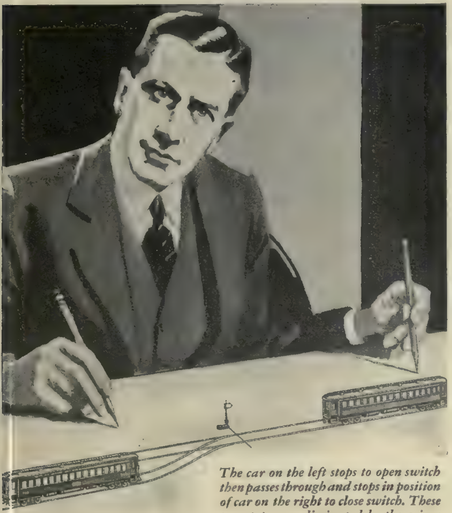
BOURKE
WHITE
PHOTOS



STEEL SECURITY

IF THE inside story were to be told of EMPIRE Bolts and Nuts, we should be willing to rest our case with the engineers and the purchasing agents. They must be exacting. On their vigilance depends the maintenance of service, the safety of patrons and employees. They know that the plus values in EMPIRE Nuts and Bolts mean quality and accuracy far beyond their demands. If you are an executive in charge of purchases—investigate these definite R-B-W advantages: advanced facilities in equipment, service that is alert and understanding, record time-saving in handling orders. Inquiries welcomed by any R-B-W sales office.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.
PORT CHESTER, N Y. ROCK FALLS, ILL. CORAOPOLIS, PA.
Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.



The car on the left stops to open switch then passes through and stops in position of car on the right to close switch. These two stops are eliminated by the 3-in-1 Switch Stand.

Stops

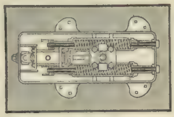
AT THE ENDS OF DOUBLE TRACK

COST MILLIONS ANNUALLY

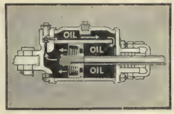
THERE is a tremendous annual cost at the ends of double track and on passing sidings where cars must stop to operate a switch. The calculated annual cost per car for this stopping and starting is large; when multiplied by each operating car the figure becomes staggering. It can be magnified further by considering the time on every schedule sacrificed to switch operation.

Such an expense is unnecessary. The Racor 3-in-1 Switch Stand combines in a single unit an automatic return after trailing car has passed, an oil buffer preventing return between successive pairs of wheels, and a rigid-throw always ready for hand operation. Cars approaching the 3-in-1 and having the right-of-way pass with safety to the car and switch points. The target, rigidly attached, always showing the exact position of the points, is a reliable factor of safety.

Write today for complete printed information about the 3-in-1, a modern and mechanically efficient Switch Stand.



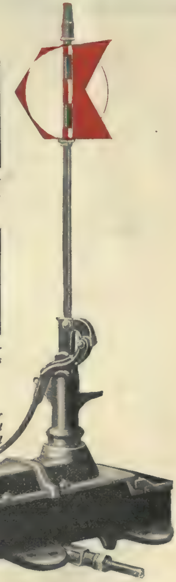
The automatic double-coil spring return after trailing car has passed.



The adjustable oil buffer preventing return between successive pairs of wheels.

• • •

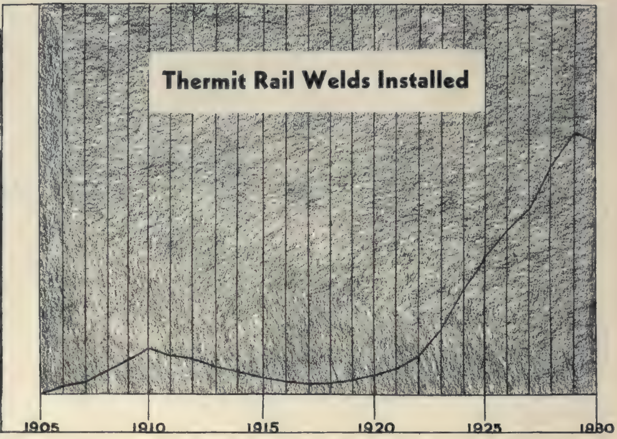
The rigid-throw always ready for hand operation. Parts simple and readily accessible for oiling and inspection.



RACOR
TRADE MARK

RAMAPO AJAX CORPORATION

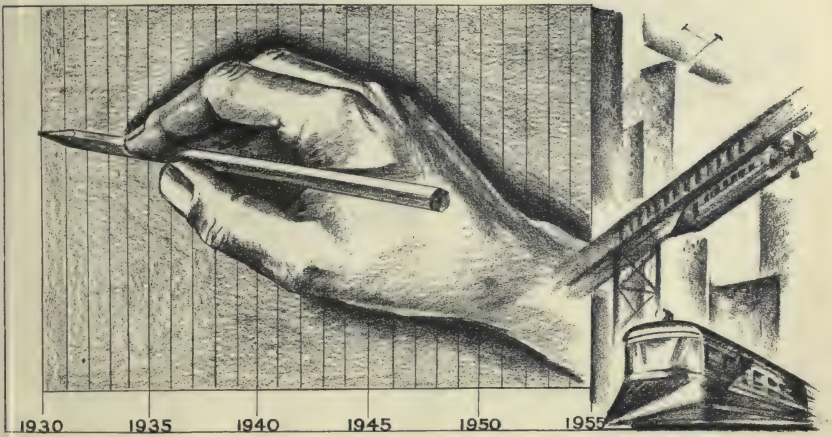
Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . Niagara Falls, Ontario
General Offices—230 Park Avenue, New York
Sales Offices at Works, and McCormick Bldg., Chicago—Midland Bank Bldg., Cleveland, Ohio
Metropolitan Bank Building, Washington Builders Exchange Building, St. Paul
Nine Racor Works: **Hillburn, N. Y., Niagara Falls, N. Y., Chicago, Ill., East St. Louis, Ill., Superior, Wis., Pueblo, Col., Los Angeles, Cal., Seattle, Wash., Niagara Falls, Ont.**



THE FIRST 25 YEARS

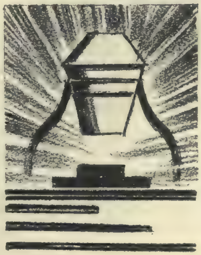
THE process of Thermit Welding was first introduced in the United States by Dr. Hans Goldschmidt of Germany in 1903 and operations were carried on by the foreign company which owned the patents. In 1905 the right to use the patents was turned over to the Goldschmidt-Thermit Company which became actively engaged in introducing the Thermit process in North America . . . Later on the Goldschmidt-Thermit Company without change in management was taken over by the Metal & Thermit Corporation, an organization of American business men and American capital . . . The Metal & Thermit Corporation is, therefore, one of the earliest companies in America engaged in welding operations. The Thermit method of welding had several important fields, one of which was welding of rails on street railways. This method was such a radical departure from the standards of street railway practice that it could be introduced only slowly . . . The World War, 1914 to 1918, so disrupted metal markets that aluminum became practically unobtainable for ordinary commercial projects. Thermit rail welding was, therefore, materially curtailed . . . The process itself, however, had been greatly improved and the early experimental installations had been showing their worth. In 1922 the present so-called Center-Pour Process was adopted. This reduced the amount of Thermit required for a weld approximately 50% and made the process economical in first cost, in addition to the economy in final cost which had already been proved. Since then there has been continued improvement resulting in an astonishing growth in the use of Thermit welds, up to the high point of 1929 . . . The recent curtailment of track construction on many street railways was reflected in a slight decline in the total welded joints installed in 1930, but the number of users increased.

The
METAL & THERMIT
CORPORATION
120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So. San Francisco Toronto



THE NEXT 25 YEARS

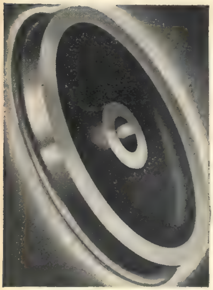
A QUARTER of a century has firmly established Thermit as an accepted method of welding . . . Thermit is not confined to any ne field or industry . . . It is used widely for heavy repair welding in steel mills, for marine repair work, n locomotive shops and in industrial plants. Its use in production work s steadily increasing . . . It is finding considerable acceptance in pipe welding where a perfect joint is required . . . It is now favorably looked upon for main line track welding on steam railroads . . . In he electric railway field more and more companies are using Thermit for repairing old joints as well as for welding new track. The opportunities in this direction are almost unlimited. Miles and miles of street railway track now in poor condition due to worn and battered joints can and will be repaired in the future . . . Now Thermit welding can be successfully and economically done without interference to traffic . . . Thermit welding offers a means of making old track almost as good as new. When Thermit-welded throughout, the life of any track is limited only by the total wearing life of the rail head itself . . . Entering thus on the second quarter of a century, The Metal & Thermit Corporation looks forward to its own future and to the future of the electric railway industry with optimism. Business depressions come and they are troublesome enough while they last. But they always pass, and worth-while business and industry survives and goes ahead stronger than ever . . . To the electric railways of America we extend New Year's Greetings and our best wishes . . . Their prosperity and their success is likewise ours.



The
METAL & THERMIT
CORPORATION

120 Broadway, New York, N. Y.
ittsburgh Chicago Albany So. San Francisco Toronto

that qualify for ANY service



No matter how exacting your service conditions may be, Carnegie Wrought Steel Wheels will more than measure up to your requirements. They are built to withstand the stress of modern traffic—peak loads, rapid acceleration and emergency stopping. The rolling and forging process by which they are manufactured imparts to the steel exceptional strength and endurance—exceptional safety.

Carnegie Wrought Steel Wheels have long been accepted as the standard of excellence under railroad passenger cars, where the service is severe and where utmost safety precautions are taken. Under electric cars they render the same safe, trouble-free, economical service. Before you invest in wheels, investigate the many advantages of Carnegie Wrought Steel Wheels.

CARNEGIE STEEL COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

91

CARNEGIE

WROUGHT STEEL WHEELS

Twin Coach
BY F.R.FAGEOL KENT,OHIO

FROM 13th PLACE
to 2nd
IN THE INDUSTRY

It must be
the coming equipment
to buy

The 1930 purchases of conventional gasoline motor coaches and trolley buses by American railway operators show Twin Coach second in total units sold.

Only three years ago the Twin Coach Corporation stood at the foot of a list of 13 builders of rubber tired transportation equipment.

Such a rise is conclusive proof that the product of Frank R. Fageol should be given earnest consideration by those responsible for 1931 bus purchases.

3 *out of* 5
Winners in Bus Transportation
Maintenance Awards
were operators of TWINS

The 1930 trolley bus purchases by the railway industry show that Twin Coach equipment led by a margin of almost 50% over that of the next builder.

In fact, nearly 50% of all the trolley buses purchased were Twin Coaches.

In the past few months practically every other builder of this equipment has endeavored to copy the outward appearance of the Twin Coach trolley bus with greatly varying success.

It is the TWINS' *greatest advertisement.*

Have you or your
mechanical men personally
investigated the latest
TWIN *improvements?*

Keeping Faith - -
With the CUSTOMER

The end of 1930 witnesses the Twin Coach definitely outstanding as the most seasoned and stabilized unit in the entire coach field. Not a single basic change in design has been necessary in three and one-half years. Such is the greatest test of mechanical merit.

And we can think of no better way to emphasize that the purchasers of Twin Coaches buy with absolute insurance against obsolescence.

Now, imitation, the sincerest form of industrial approval, is breaking out on all sides, all the way from body proportions to dual power plants.

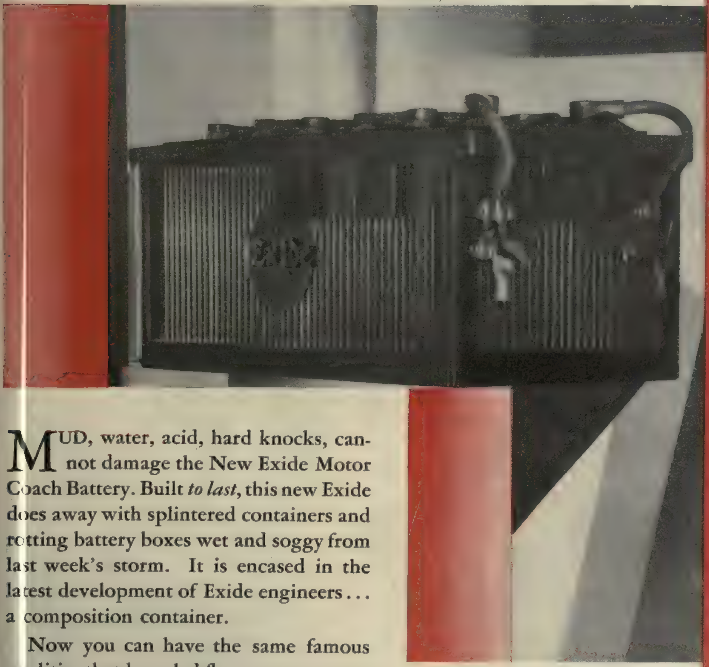
Stubbornly, but conclusively, competition has discovered that only in the use of the Twin Coach principle is it possible to apportion the power required for various transportation tasks without a complete redesign, or the costly development of a new model.

Therefore, that which makes us happiest at this end of the year period is the complete vindication of those wide-awake operators who as early as 1927 pledged their faith in our design.

Reproduced from
ELECTRIC RAILWAY
JOURNAL WEEKLY
Issue of Dec. 20th

Twin Coach
BY F.R.FAGEOL KENT.OHIO

The Toughest Bus Service WON'T BOTHER *this* NEW EXIDE BATTERY



Latest development of Exide engineers for improved bus battery service

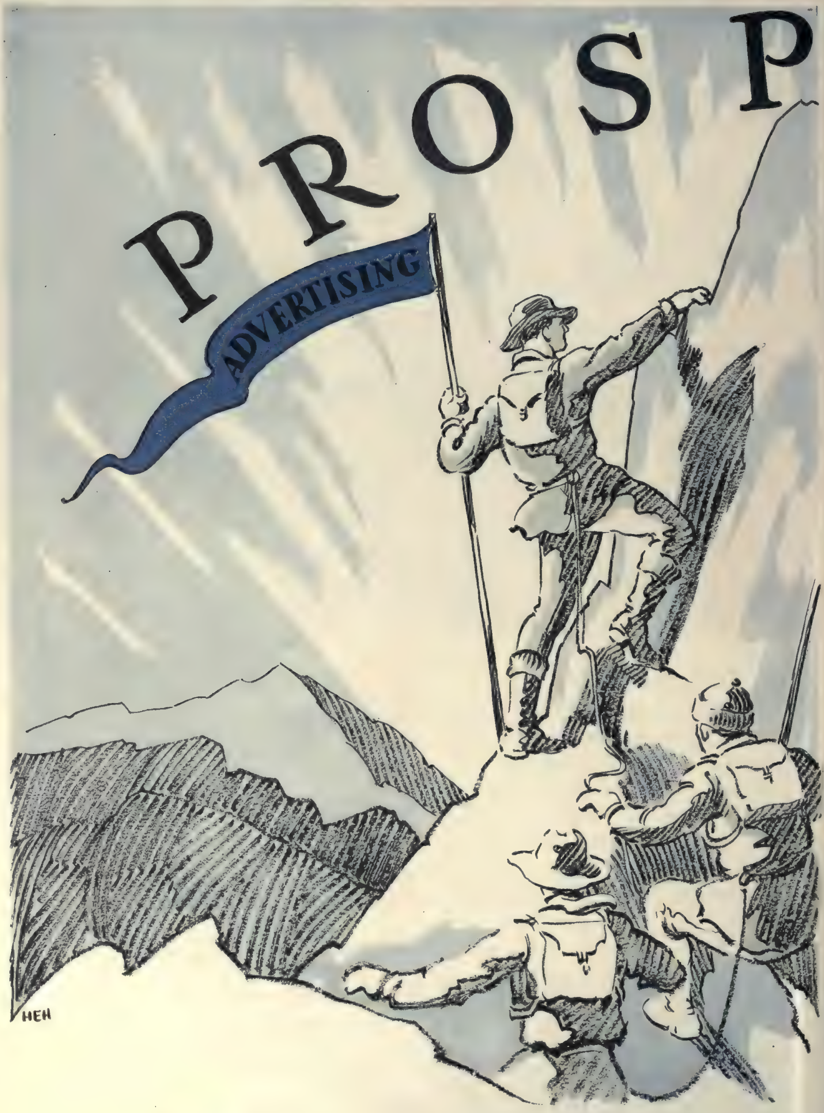
MUD, water, acid, hard knocks, cannot damage the New Exide Motor Coach Battery. Built *to last*, this new Exide does away with splintered containers and rotting battery boxes wet and soggy from last week's storm. It is encased in the latest development of Exide engineers . . . a composition container.

Now you can have the same famous qualities that have led fleet owners everywhere to standardize on Exides, *plus* increased economy and dependability.

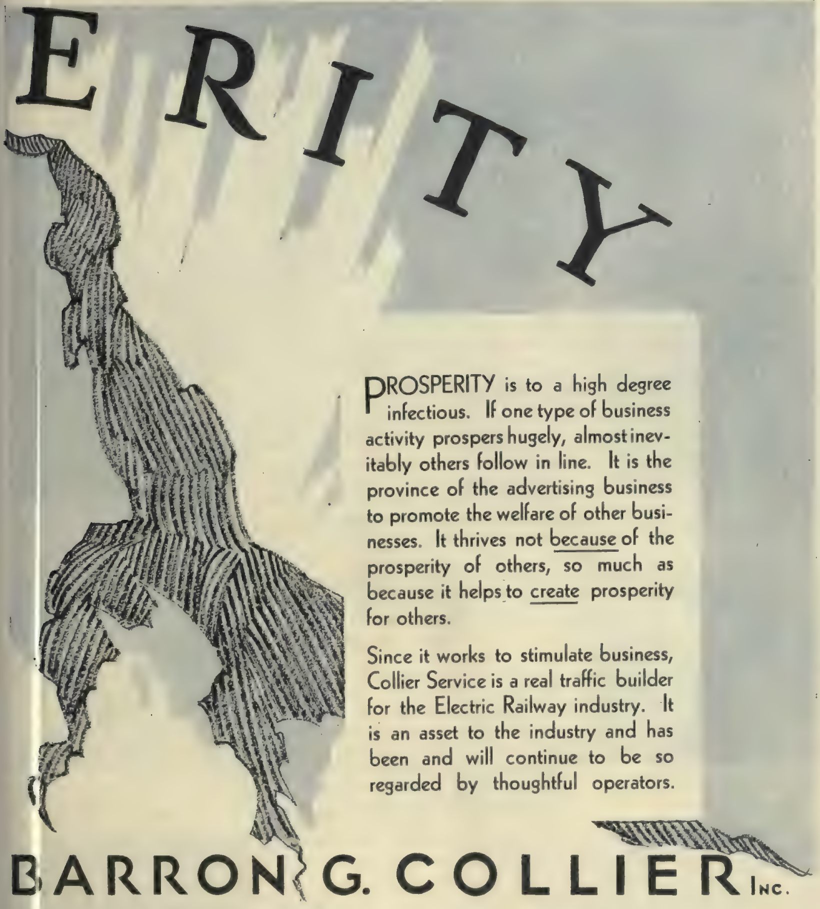
Write for information on the New Exide Motor Coach Battery. Let us show you how it can save you money . . . cut your maintenance costs.

Exide
MOTOR COACH BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto



CAR CARD ADVERTISING ALMOST



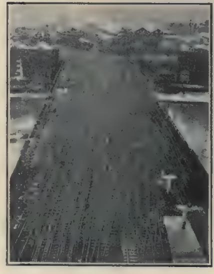
PROSPERITY is to a high degree infectious. If one type of business activity prospers hugely, almost inevitably others follow in line. It is the province of the advertising business to promote the welfare of other businesses. It thrives not because of the prosperity of others, so much as because it helps to create prosperity for others.

Since it works to stimulate business, Collier Service is a real traffic builder for the Electric Railway industry. It is an asset to the industry and has been and will continue to be so regarded by thoughtful operators.

BARRON G. COLLIER INC.
CANDLER BLD'G NEW YORK CITY

EVERYWHERE

GLOBE COVERING



"UNION" Systems cover the world. You can find Union Interlocking and Signal Systems in America, England, the Continent, Africa, Asia, Australia. There are many reasons for their popularity, but these are the four which are most important: First, simplicity of design; then, an extremely long life in service; many plants which have been in service for as long as 36 years are still in excellent condition; and a rugged, compact, construction which insures low maintenance costs. These advantages make Union Systems and apparatus important considerations in the economical operation of electric and steam railways.

In America there are 80 Remote Control and Centralized Traffic Control Systems. Union Cab Signals are installed on more than 4200 locomotives and over 6700 miles of track. Union Highway Crossing Signals are protecting thousands of grade crossings, reducing property damage, saving lives.

These systems will fit your operating conditions. They yield an attractive return on investment, frequently paying for themselves in one to four years. And they furnish an increased safety of operation which makes possible closer, faster schedules.

We shall be glad to give you any information you wish or require. Just write to us.

1881 TRADE MARK **Union Switch & Signal Co.** TRADE MARK 1931

SWISSVALE, PA.

NEW YORK MONTREAL CHICAGO ST. LOUIS SAN FRANCISCO

ALMOST
EVERY PROMINENT
USER OF WHITE 6-54'S
HAS TURNED TO
CLECO - GRUSS AIR SPRINGS

OUR belief that "the finer the coach, the more value from Air Springs" has again been vindicated by the country-wide acceptance of Cleco-Gruss Air Springs by the operators using White 6-54's — one of the finest, easiest-riding jobs ever produced. Below is a partial list of these operators —

Greyhound Lines
Florida Motor Lines
Consolidated Coach Corp.
Southwestern Transportation Co.
Safety Transit Lines, Inc.
Great Eastern Stages
Ohio Valley Transit Co.
Lycoming Auto Transit Company
King Transportation Company
Carolina Coach Company
Eastern Tennessee and Western North Carolina Motor Transportation Co.
Big Beaver Bus Company
Berea Bus Line
Union Pacific
Yankee Stages
Capitol Coaches
Somerset Bus Company
Automotive Transportation Co.
Missouri-Pacific Trans. Co.
Blue & Grey Lines
Red Star Way, Inc.
Cumberland & Westernport Trans. Co.
The Ward Way, Inc.
Collacutt Coach Lines (Canada)
Sioux Falls Traction Co.
Jefferson Highway Co.

A corresponding acceptance of Cleco-Gruss Air Springs is also found among the users of White 54-A's and 65's. Write today for Air Spring prices on your equipment. They pay their way many times over in vehicle maintenance and passenger comfort.

CLECO AUTOMOTIVE PRODUCTS
MANUFACTURED BY THE CLEVELAND PNEUMATIC TOOL CO., CLEVELAND, OHIO

Not one sewn seam ..and it's *BIAS* cut

LONG continuous lengths . . . no seams to cut out . . . no waste of time and material! You get all this in the new Empire Seamless Bias Cloth that has won such immediate popularity with manufacturers and repairmen alike.

More than this! Empire Seamless Bias Tape has greater dielectric and mechanical strength than sewn bias. This insulation contribution has been made possible through the development of a special base cloth, which cloth has also permitted of savings that we are passing on to you.

This insulating cloth is available in either black or yellow finish, in tape form or in rolls 36 in. wide. Send for samples!

MICA INSULATOR COMPANY
New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco
Los Angeles Toronto Montreal *Works:* Schenectady, N. Y. London, Eng.

PERFECT MICANITE INSULATOR REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR REG. U.S. PAT. OFF

MICA INSULATION OILED CLOTH INSULATION

WE MAKE OUR OWN STEEL

Because we make our own steel, each "Standard" part can be made of exactly the right steel to give it the maximum wearing qualities in service. Were we dependent on outside sources of supply the quality of "Standard" Steel Parts could not be so uniformly high.

STANDARD PRODUCTS

Steel Axles Steel Springs Armature Shafts Rolled Steel Wheels

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES AND WORKS: BURNHAM, PA.

CHICAGO
NEW YORK
RICHMOND
ST. LOUIS
PHILADELPHIA
PORTLAND
SAN FRANCISCO

LET'S LOOK AT 1931 SENSIBLY

THE YEAR opens with plenty of available money. National credit was never so good. The shelves of the nation are bare. Prices are down and logically should move upward.

It is time to prepare for a business advance. Reports indicate that already many important lines are showing a healthy movement toward normal profits. The big job is to stamp out pessimism and go to work intelligently to make conditions good.

Now more than ever, sound operating management of any business requires that the details be reviewed with care. One detail of first importance to any operating executive is lubrication of equipment.

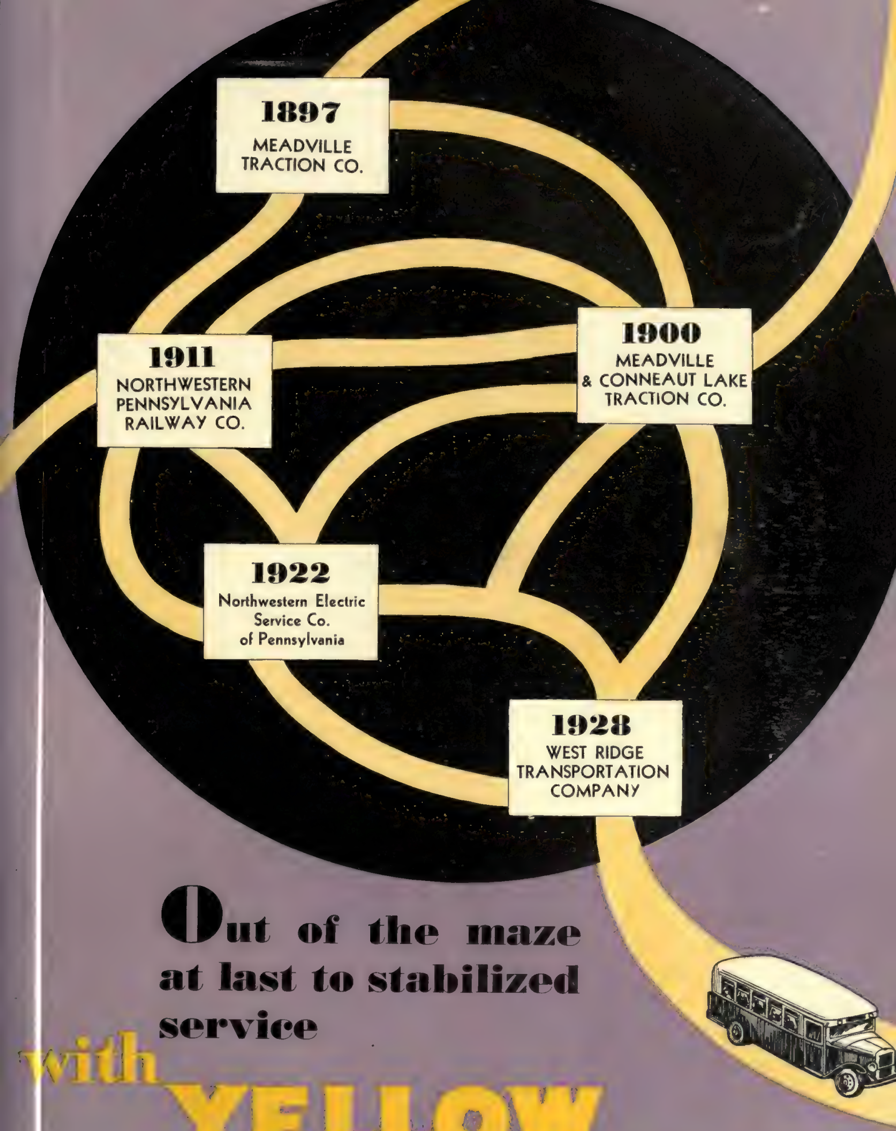
We suggest that you allow our engineering staff to make a survey of your plant and advise with you as to the most efficient and economical practices. The value of scientifically correct lubrication becomes apparent at once and in many ways. For example, such a survey will show you a possible immediate reduction in lubrication cost, a saving in power, and a positive reduction in repair and replacement expense.

Call in one of our engineers. He will study your particular requirements and recommend a lubrication program which will give you lubrication efficiency and economy. This service costs you nothing, neither does it obligate you in any way.

LUBRICANTS
FOR EVERY
INDUSTRIAL
PURPOSE

STANDARD OIL COMPANY *(Indiana)*
910 South Michigan Avenue Chicago, Illinois

Ind.Spec.


1897
MEADVILLE TRACTION CO.
1900
MEADVILLE & CONNEAUT LAKE TRACTION CO.
1911
NORTHWESTERN PENNSYLVANIA RAILWAY CO.
1922
Northwestern Electric Service Co. of Pennsylvania
1928
WEST RIDGE TRANSPORTATION COMPANY

Out of the maze at last to stabilized service

with YELLOW COACHES

The solution of old problems often lies in new methods

for exampl

TAKE the Erie-Meadville Division of th West Ridge Transportation Company of Meadvill Pennsylvania—typical of what so many companie go through in changes and reorganizations in orde to meet modern day conditions.

About 43 years ago, a small traction company wa incorporated to serve the city of Meadville with 1 trolley cars and 11 miles of track.

The new plan of operation in each city and town includes the principal hotels and the business centers thus giving a more convenient service and eliminating the need of transfers and taxicabs.

Earnings held out sufficient promise to encourage extending the line to Conneaut Lake, Harmonsburg and Linesville—and the operation, in 1900, became known as the Meadville & Conneaut Lake Traction Co. Hundreds of operators have passed through this stage—a change in name to take care of expansion and its promising expectations.

But the sifting process still continued and again, in 1911, name and management were shuffled with the Northwestern Pennsylvania Railway Co. in control. A new line was built to the city of Erie, patronized largely by passengers to and from Cambridge Springs to reach Conneaut Lake.

Business was good—apparently—but the management failed to see the dark cloud hidden just below the horizon. With 68 miles of track, 3,200,000 passengers were being carried by 43 electric cars, earning a gross revenue of $280,000 in 1915 with a net of $64,000. *But this was the peak.* Automobile competition had arrived. People liked this new form of transportation, began to use it in ever-increasing numbers, to the detriment of earnings.

Every automobile traveler was a lost trolley user and a potential bus passenger. Sensing this change, the company early put on buses, but the tremendous capitalization of the electric railway lines hindered complete development of this new service. Like others who were then passing through the same stage, the bus was used as a protection against the encroachments of other bus operators, instead of a potential business getter, yet even so the four, 4-cylinder parlor coaches running between Meadville and Erie clearly demonstrated their earning ability. Further changes in name and organization followed, and when city bus service was started in Meadville, in 1927, the load of street car operation proved too much. For the year ending in July, 1928, the operating company faced these figures—

Investment, $3,000,000. Passengers and freight earnings, $170,000. Expenses, $235,000. Deficit, $65,000.

Faced with the prospect of further losses, the company decided in October, 1928, to sell the entire operation to a new management, more familiar with motor coach transportation and possessed of unbounded confidence in its future. Sixty-three miles of franchised motor coach routes, five 21-

During 1928, the Meadville City operation took in $42,000 gross. Under the new plan of operation, for the year ending July, 1930, gross earnings increased to $56,600 and operating costs were reduced from 20 cents per mile to 16.5.

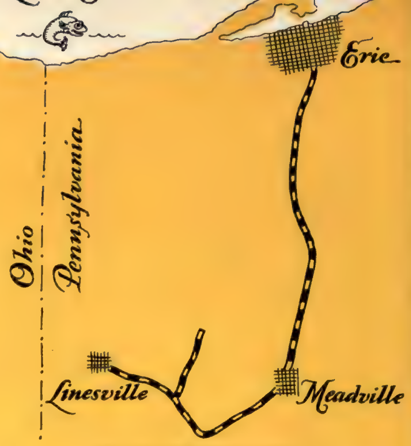
passenger city coaches and four 29-passenger parlor coaches changed hands.

Immediately three new 29-passenger Yellow Coaches were placed on the Meadville-Erie route, schedules were completely revised to supply maximum service without dead hauls, an extension line was started to serve the new plant of the Viscose Company of America.

Due to the improved type of Coaches used, maintenance expense dropped. Punctuality with safety became the watchword. Public good-will, that had been slipping fast, was regained. The traveling public rode the coaches gladly, welcome of the change.

From the very first month, the operation earned money. Both city and intercity earnings improved. Black ink replaced red and costs decreased as profits mounted. Transportation history had again duplicated the page written for so many other companies and again demonstrated that—

"It can be done—with Yellow Coaches"



The West Ridge Transportation Co. is now giving 14 hourly trips between Erie and Meadville—distance 40 miles—Running time 1 hour and 50 minutes as against 2 hours and 9 minutes formerly by trolley.

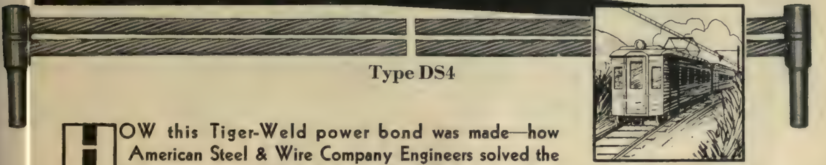
The Comparative Statemen of Income and Expense

1927 Northwestern Electric Service *Erie to Meadville*		1929 West Ridge Transportation Co. *Erie to Meadville Division*	
Revenues	$187,568	Revenues	$140,749.8
Operating Expenses	377,225	Operating Expenses	92,409.2
Interest	118,5511	Inc. (depreciation at 33$\frac{1}{3}$%	
Dividend Requirements	125,461		

It can be done - with Yellow Coaches

ERAL MOTORS TRUCK CO. - - PONTIAC, MICH
Subsidiary of Yellow Truck & Coach Mfg. Co.

NOW.. a new Power Bond with Strength to Spare ..Yet Capable of Carrying Necessary Current Loads..



Type DS4

Look for the Double Ring Mark in the center of the Terminal Head. It is a sign of Superior Quality and Workmanship.

HOW this Tiger-Weld power bond was made—how American Steel & Wire Company Engineers solved the problem of strength—without sacrificing the ability to carry necessary current—is a story of achievement that you will want to know about in detail. Especially so—since its inception means increased efficiency and lower operating costs. It will pay you to write for interesting literature and detailed information.

Designed for use on multi-tracked A. C. systems. The Pennsylvania Railroad adopted Type DS-4 Bonds for all A. C. Electrified Territory.

TIGER-WELD
POWER BONDS

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

208 S. La Salle Street, Chicago

30 Church Street, New York

Other Sales Offices: Atlanta Baltimore Birmingham Boston Buffalo Cincinnati Cleveland Dallas Denver Detroit Kansas City Memphis Milwaukee Minneapolis-St. Paul Oklahoma City Philadelphia Pittsburgh Salt Lake City St. Louis Wilkes-Barre Worcester

Pacific Coast Distributors; Columbia Steel Company, San Francisco Los Angeles Portland Seattle Honolulu

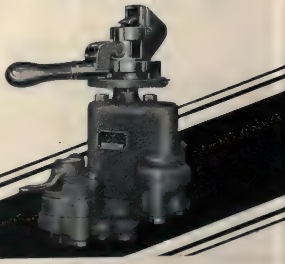
Export Distributors: United States Steel Products Co., 30 Church St., New York City

The SAFETY CAR . . .
CONTROL EQUIPMENT

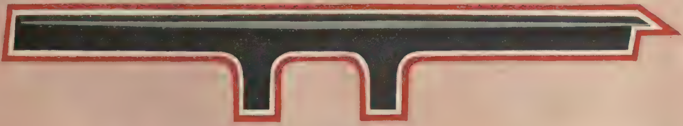
. . . now provides
additional safety . . .

THE "Self-Lapping" Brake Valve, now available for Safety Car Control equipments, adds a new element of safety—it permits the desired cylinder pressure to be obtained more readily, and assures that the fast application and release, provided by the Relay Valve, can be properly controlled so as to realize the maximum benefits.

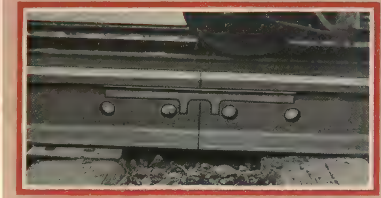
SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



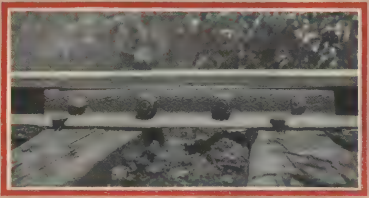
TRUE TEMPER TAPERED RAIL JOINT SHIM



The Remedy for Low Joints caused by wear



The above shows Joint Shim in position with angle bar removed.



The above shows Joint Shim in position between Bar and Ball of Rail.

Other True Temper Products for Electric Railway Use:

- Safety Rail Forks
- Railroad Scuffle Hoes
- Ice Chisels
- Road, Gravel and Cleaning Rakes
- Sidewalk Cleaners

Send for a free copy of our Catalog RAD1, which describes these and other True Temper Products for Electric Railway use.

THE AMERICAN FORK & HOE COMPANY

General Offices: CLEVELAND, OHIO; Factory: NORTH GIRARD, PA.

District Offices
253 Broadway, New York, N. Y. Daily News Plaza, Chicago, Ill.
Representatives at
Boston, Denver, Detroit, Louisville, Minneapolis, St. Louis and San Francisco
Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N. Y., and
68-72 Windsor House, Victoria St., London, S.W.-1.

DUNDEE "A" STICKS IN PLACE

DUNDEE "A" friction tape is popular with electrical workers because it sticks quickly and therefore it is easy to use. Foremen and superintendents like it because it does not dry out and therefore it stays in place.

Dundee "A" is a true friction tape. The adhesive compound is not merely spread on the cotton fabric but is calendered under heavy pressure into every part of the cloth. For that reason the fabric and the adhesive never separate into layers.

In spite of the care used in its manufacture, it is moderately priced. Specify it on your next order.

THE OKONITE COMPANY
Founded 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC.
Factories: Passaic, N. J. Paterson, N. J.

SALES OFFICES:
NEW YORK CHICAGO PHILADELPHIA PITTSBURGH ST. LOUIS BOSTON
ATLANTA BIRMINGHAM SAN FRANCISCO LOS ANGELES SEATTLE DALLAS

Novelty Electric Co., Philadelphia, Pa
F D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives:
Engineering Materials, Limited, Montreal

Cuban Representatives:
Victor G. Mendoza Co., Havana

OKONITE PRODUCTS

Okonite Insulated Wires and Cables
•
Varnished Cambric Cables
•
Okonite Insulating Tape
•
Manson & Dundee Friction Tapes
•
Okocord
•
Okoloom

OKONITE-CALLENDER PRODUCTS

Impregnated Paper Cables
•
Super-tension Cables
•
Splicing Materials

Note double slide reversible feature

2,216,176 Miles—
NO trolley breaks
With

IONLOYD

Reversible

TROLLEY SHOES

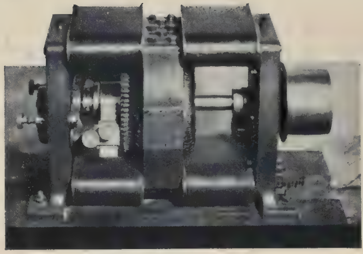
On East Jefferson Avenue, Detroit, one of the country's highest speed express lines, IONLOYD reversible trolley shoes made this startling record over a full year period of test.

146,888 car movements, 2,216,176 car miles without a single trolley break.

The remarkable lack of overhead damage— the reduction of trolley noise— elimination of radio interference— and the low cost per mile of trolley contact — are a few reasons why these shoes are now standard on all Detroit cars.

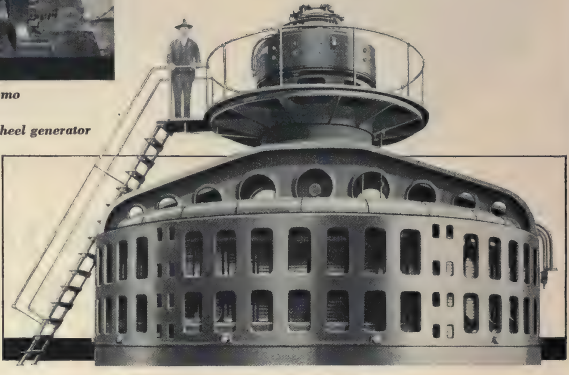
Let us show results on your property

EFFICIENCY PRODUCTS CORPORATION
1203 Barlum Tower, Detroit, Michigan



mill-wheels

Wood, 5-light arc dynamo



18750 *K. V. A.*, 6600-*volt water-wheel generator*

THE old mill-wheel holds an honored place in our country's industrial history. But the mill-wheel has gone to make way for the more efficient hydraulic turbine and great hydro-electric plants distributing light and power to homes and factories for miles around.

As electricity began to force its way into the industrial world, certain names became associated with its progress. Among others is that of James J. Wood. The Wood dynamo is one of the many contributions made by this eminent engineer. It supplied the current for lighting the more progressive industrial plants.

Companies, as well as individuals, rose to positions of leadership during this era of transition. Due to the quality of its products, National Carbon Company, Inc., came to be recognized as a leader in carbon manufacture. National Carbon Brushes contributed in no small degree to the development and application of electrical power.

The canvas of the artist has preserved for us the old mill-wheel. The Wood arc dynamo shown on this page rests in a great museum. But both live again in the modern wheel of industry. Huge water-wheel generators, like that illustrated above, convert the water-power of our streams to the needs of industry. They are the mill-wheels of today.

The research facilities of National Carbon Company, Inc., have provided a brush for every requirement of electrical industry and assure the production of grades to meet the needs of the future. Systematic maintenance of equipment and National Pyramid Brushes keep the modern mill-wheels turning at minimum operating cost.

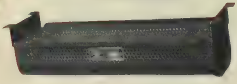
NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide UCC *and Carbon Corporation*

Carbon Sales Division SILVER STRAND CABLE TRADE MARK REGISTERED Cleveland, Ohio

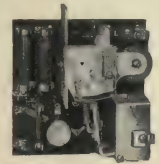
Branch Offices and Factories:
New York Pittsburgh Chicago San Francisco

UTILITY



Cross Seat Heater

Heating and Ventilating Equipment for Electric and Steam Railway Cars — Trackless Trolleys and Buses



No. 10 Heat Regulator

Utility Heat Regulators economize in current.

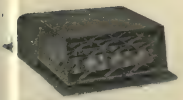
Utility Ventilators keep the air pure and wholesome.

Utility Heaters fitted with Chromalox enclosed elements carry the Underwriters' Laboratories Label.

Chromalox Strip

More than 200,000 Chromalox strips have proven their worth in service on 233 properties operating on 550, 1200 and 1500 volts.

Write us now. Learn the full details and advantages of Utility Equipment.



Utility Improved Honeycomb Ventilator

RAILWAY UTILITY CO.

2241 INDIANA AVE., CHICAGO, ILL.

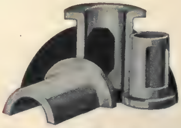
H. Dayton, Eastern Manager 1328 Broadway, New York City

“NATIONAL” PRODUCTS

Save

Trolley Wheels and Harps

The “Vigne” Bimetallic Armature Bearing



“Tiger” Bronze Axle and Armature Bearings

M-J Armature Babbitt

More Operating Dollars

This can invariably be accomplished by installing "NATIONAL" Electric Railway Specialties.

The organization back of these products has been identified with the Electric Traction industry for fifty-six years. During this period, we have built up a huge reservoir of information and experience—which are available for the asking.

Let us help you if we can—
and we believe we can.

NATIONAL BEARING
METALS CORPORATION
ST. LOUIS, MO.

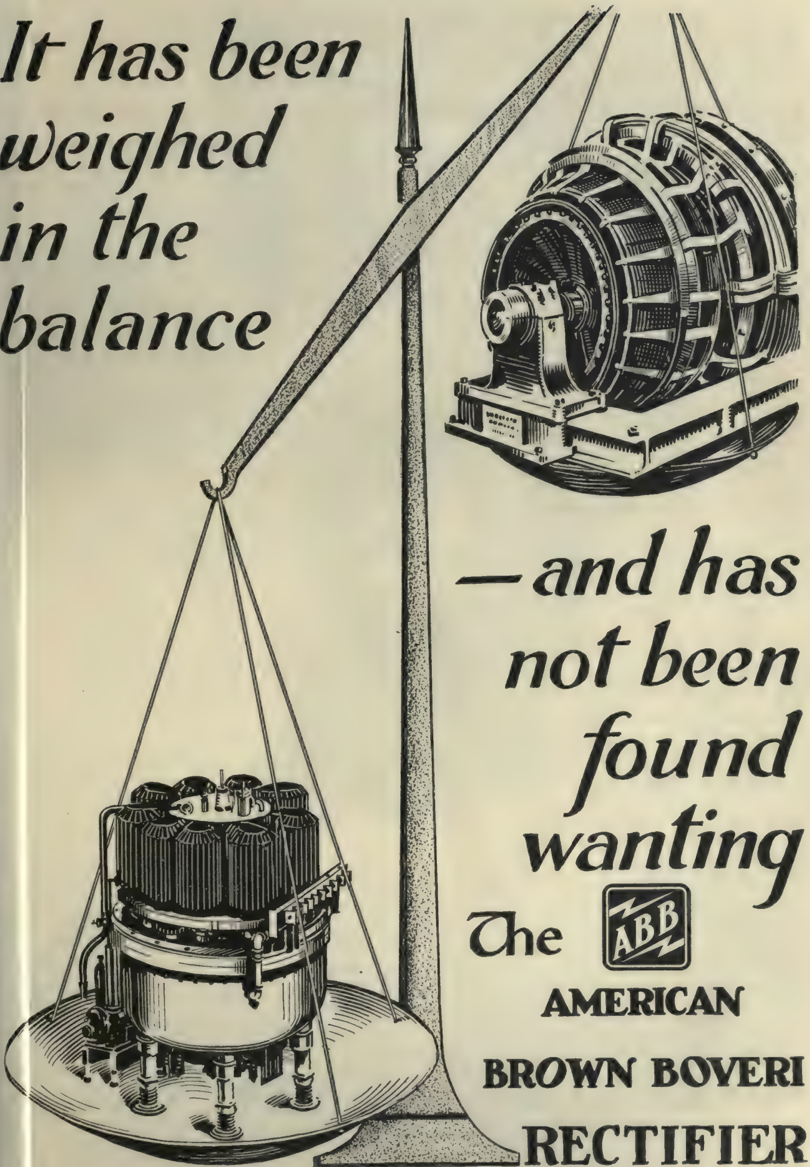
New York, N. Y.
Meadville, Pa.
Jersey City, N. J.
Portsmouth, Va.
Pittsburgh, Pa.
St. Paul, Minn.

ART RATTAN SEATS not only have an inviting look about them but a comfortable riding ease that keeps the riding public happy.

That is one side of the story, then from the operators' standpoint a sturdy, well designed seat which has established records for low maintenance.

Bus and Electric Railway operating companies from all parts of the country have profited by specifying Art Rattan seats. You can do the same. Consult Art Rattan.

Art Rattan Works, Inc
Cleveland, Ohio.........Oakland, California
Builders of De Luxe Bus and Street Car Seats

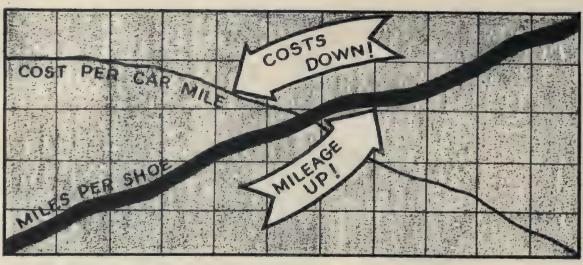


It has been weighed in the balance

—and has not been found wanting

The ABB

AMERICAN BROWN BOVERI RECTIFIER



MILLER TROLLEY SHOES

3-INCH SLIDING CONTACT

Reduces dewirements.

Less wear on the wire.

Requires no lubrication.

Fits standard trolley poles.

MORE mileage between replacements and lower cost per mile—those are the objectives of every operator!

Miller Trolley Shoes have solved this problem for other roads—they may do it on your property. It will pay you to investigate—to try out this smooth sliding contact which clings to the wire at high speeds and reduces that arcing and burning that shortens the life of both the trolley wheels and the trolley wire.

For a trial we recommend the equipment of one entire line or branch with Miller Trolley Shoes, rather than using a single one where trolley wheels are on the same wire. Wherever wheels cause arcs, they roughen the wire and prevent the trolley shoe from operating at its best.

MILLER TROLLEY SHOE CO.

Columbia Road, Boston 21,
Massachusetts

Safe

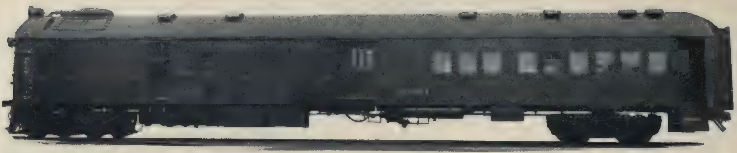
Saves
Labor

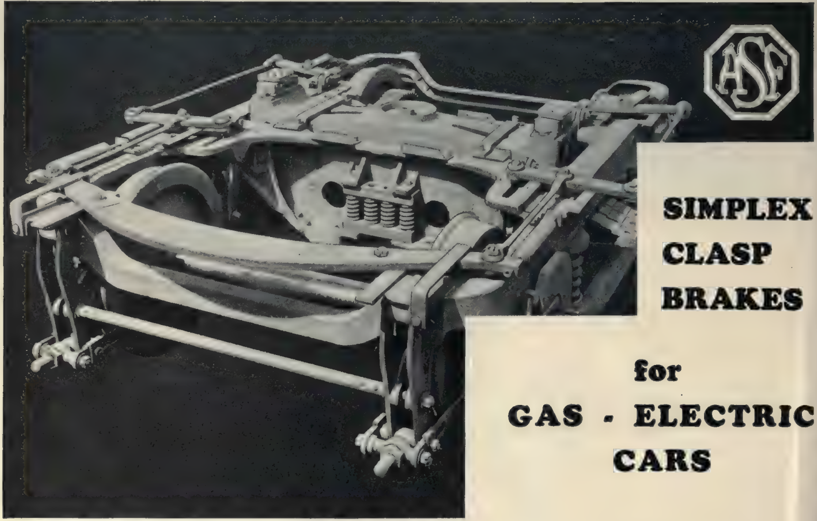
70
ELECTRIC RAILWAYS
are building track with Differential Cars

Whether large track reconstruction programs are contemplated or small maintenance jobs, Differential cars will do the work with less cost than other methods. Differential cars save time and labor. Do not interfere with other traffic. Strengthen public relations. Require little maintenance. Are absolutely safe and have an unusually long life.

Other Differential equipment for track maintenance and construction include the Differential Electric Locomotive Crane Car, the Clark Concrete Breaker, the Differential Bottom Dump Ballast Car, the Differential 3-way Dump Body for auto trucks and the Differential Car Wheel Truck and Tractor for power shovels.

THE DIFFERENTIAL STEEL CAR CO.
FINDLAY, OHIO





SIMPLEX CLASP BRAKES

for

GAS - ELECTRIC CARS

RAILROADS of the country are using American Steel Foundries Clasp Brakes for passenger equipment.

Greater retardation; reduction in brake shoe wear; desirable balancing of braking forces—all have proved the value of Clasp Brakes.

Gas-electric cars have increased in weight and size until they now are frequently larger than standard passenger cars. For these reasons, they, too, need Simplex Clasp Brakes. Clasp Brakes are applicable to Gas-Electric Car Trucks and should be included in your specifications.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

OHMER REGISTERS

Protect the Income
Increase the Income
Speed Up Traffic

for

City

Suburban

and

Interurban

Transportation

Whether you operate electric railways or motor coach lines, you will find the effectiveness of Ohmer Registers to be far reaching and satisfactory.

It is a far cry from the first Ohmer Indicating and Recording Fare Registers supplied to the electric railways of thirty years ago to the almost unlimited variety of highly efficient fare protecting devices and equipment fixtures manufactured by Ohmer today.

While those fundamental features which made Ohmer Fare Registers successful from the very start have been retained in all of the later models, yet such vast improvements in the application of the Ohmer "Idea" have been made that today, no matter what serious fare collecting problems confront the management of an electric railway or a motor coach company, there will be found an Ohmer Register with the proper Ohmer fixtures to meet the situation satisfactorily and completely.

If you have an immediate problem to solve, let us know about it. We will gladly help you.

OHMER FARE REGISTER COMPANY • • Dayton, Ohio, U. S. A.

INSURE TRACK PAVING

with

Carey Elastite

RAIL FILLER

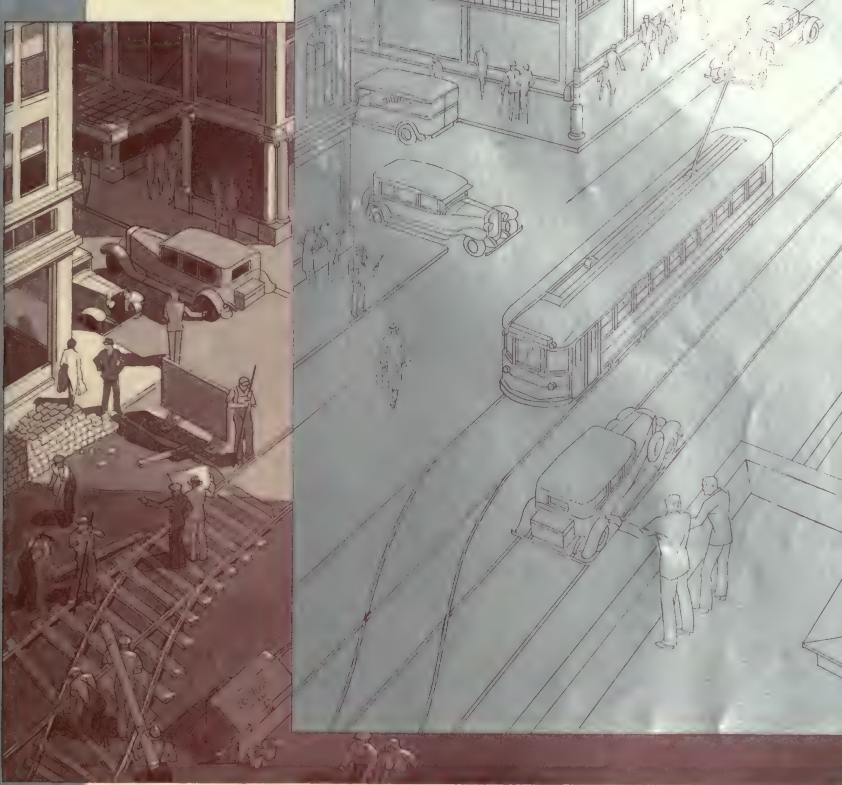
Paving repairs next to rails are greatly reduced when Carey Elastite Rail Filler is used. Rail pounding and vibration is absorbed by the asphalt compound instead of being transmitted to the paving. The "kick-ups" and breaks so typical of track paving are eliminated, and the cost of the Rail Filler is saved many times by the lower repair charges.

Elastite Rail Filler is premoulded to fit the rail section, and the installation is therefore rapid and inexpensive. It is extremely durable, because made of reinforced asphalt compound, and does not disintegrate or change position when installed. We will submit full information, including prices, if you will advise us the details of any proposed paving. Be sure to state rail section number and weight.

Other CAREY Products

- **Elastite Expansion Joint**
- **Built-up Roofs**
- **Heat Insulations**
- **Careystone Corrugated Sheets**
- **Roof Paints**
- **Careystone Shingles**
- **Asfaltslate Shingles**
- **Asbestos Products**

THE PHILIP CAREY COMPANY -:- *Lockland,* Cincinnati, Ohio



Light in weight, Alcoa Aluminum Street Cars reduce wear on tracks and road bed

ALCOA ALUMINUM

STRONG TO BEAR BURDENS — LIGHT TO MOVE

4,325 pounds of Alcoa Aluminum used 7,863 pounds of dead-weight saved

Nearly two pounds of dead-weight were saved by every pound of Alcoa Aluminum used in this car. It was built by Osgood-Bradley Car Company for Pittsburgh Street Railways. The light, strong Alloys of Alcoa Aluminum were used for body, underframe and trucks, except axles, wheels and springs.

Excess dead-weight is a severe drain on street railway income. A 30% reduction in non-pay load—and these Alloys offer even greater reduction—has turned losses into profits for many street car companies. Light weight cars built of the light, strong Alloys of Alcoa Aluminum make better time, more round trips per day—and collect more fares. They start and stop more smoothly. By adding to comfort and reducing running time, they attract extra passengers.

Cars built of the light, strong Alloys of Alcoa Aluminum also bring reductions in operating expense. These Alloys are highly resistant to corrosion. They add to car life. Because aluminum cars are lighter they stay out of the shop longer and are easier on tracks and road bed. The Alloys of Alcoa Aluminum have tensile strength as high as 58,000 lbs. per square inch minimum. They weigh ⅓ as much as other structural metals. They are easy to fabricate.

Our nearest office will gladly send a representative to give you full particulars. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

STRONG TO BEAR BURDENS — LIGHT TO MOVE

Rounding Out a Quarter Century of Service to the Electric Industry

1906 Union Metal originated the first ornamental lighting standards as we know them today. Pioneering not only in design but in construction, Union Metal developed the pressed steel standard which was destined to write a new chapter in the history of street illumination.

This development removed street lighting from the purely utilitarian classification and emphasized its architectural aspects. In name the City Beautiful Movement was unknown but Union Metal was working toward the ideal for which that movement has won the praise of forward-looking citizens everywhere.

1931 Union Metal has become the world's largest producer of ornamental street lighting standards. Responsible for many of the outstanding developments in outdoor lighting, the company has retained its pioneering spirit and is constantly bringing forward new developments.

A few years ago Union Metal made its greatest contribution to the City Beautiful . . . sturdy, fluted steel poles, beautiful in appearance and so strong that they easily support trolley span wires, distribution lines, and street lighting equipment. The necessity for several sets of supports is eliminated and real economy afforded the utilities. Street railways in major cities are using these poles to cut down their overhead expense and to promote better public relations.

Union Metal ends its first quarter century of service to the electric industry and to the public with the greatest year in the company's history and with increased facilities for engineering and producing Fluted Steel Poles and Street Lighting Equipment.

THE UNION METAL MANUFACTURING CO.
GENERAL OFFICES AND FACTORY . CANTON, OHIO

SALES OFFICES . New York . Chicago . Boston
Los Angeles . San Francisco . Seattle . Dallas . Atlanta

DISTRIBUTORS: General Electric Merchandise Distributors . Graybar Electric Company, Incorporated
Offices in all principal cities

UNION METAL
DISTRIBUTION POLES

Now—Rolled in the Central West

. . . for the

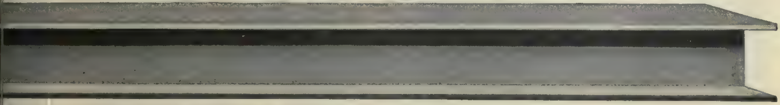
US STEEL

Illinois Steel

Subsidiary of United States

Central West

C. B. SECTIONS



The Central West now has a source of its own for the production of the popular C. B. SECTIONS, previously manufactured only by Carnegie Steel Company at Pittsburgh. Illinois Steel Company, at South Chicago Works, manufactures a complete series of C.B. SECTIONS. Production facilities for these Sections include a new open hearth plant, soaking pits, rolling mill, and ample storage facilities located adjacent to mills for the production of American Standard structural shapes. Thoroughly modern facilities for preparing and shipping C.B. SECTIONS assure expeditious service.

Company 208 SOUTH LA SALLE STREET, CHICAGO, ILLINOIS

Steel Corporation

169 Electric and Steam Lines Now Operate Timken Bearing Equipment

Tapered Roller
TIMKEN BEARING
EQUIPPED

The broad and convincing sweep of Timken Bearings throughout the rail transportation systems of the United States is shown by the number of roads operating Timken-equipped rolling stock and the steady increase in the number of units owned by each road.

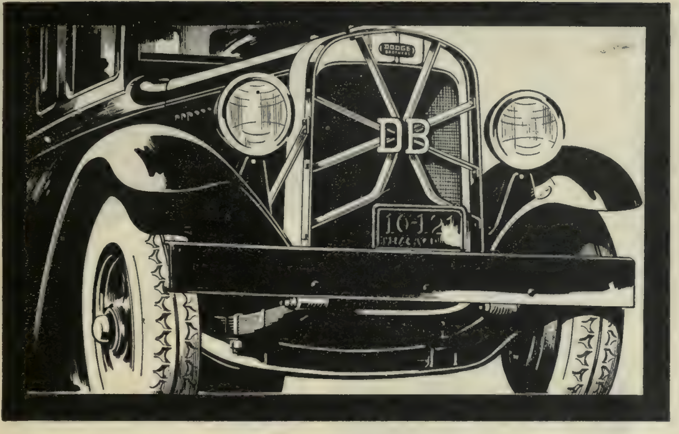
As a matter of fact, more Timken Bearings are used by the electric and steam lines of this country than any other type of anti-friction bearing.

What is the reason for this preference? What is responsible for the dominant position enjoyed by Timkens?

The answer is, the ability of the exclusive combination of Timken tapered construction, Timken positively aligned rolls, Timken-made steel and Timken precision of manufacture to fully meet every modern anti-friction necessity in all types of cars.

It means that friction is practically eliminated; that starting resistance is reduced 88%; that power is conserved; that lubricant is saved; that wheel life is lengthened; and that maintenance costs are cut to the bone. The Timken Roller Bearing Co., Canton, Ohio.

TIMKEN *Tapered Roller* BEARINGS



SEE THE COMPLETE HEAVY DUTY LINE

For the heavy duty needs of Public Utilities, there is now an unusually complete line of Dodge Trucks—ranging in payload capacities from 2,950 to 11,175 pounds. They are heavy duty trucks through and through . . . with exceptionally powerful, dependable, economical engines . . . truck-type clutches . . . sturdy 4-speed transmissions . . . deep, rugged frames . . . drive shafts, springs, internal hydraulic 4-wheel brakes and full-floating rear axles (including double reduction) that are brutes for heavy duty work and look the part.

. . .

Inspect, drive and compare these modern heavy duty Dodge Trucks. You will say that they are "all-truck"—that they look able, perform ably and are unusual values on any basis of comparison.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING 1½-TON CHASSIS AT $595

DEPENDABLE
DODGE HEAVY DUTY TRUCKS

VARTEX is seamless but costs no more

FROM end to end there isn't a seam in VARTEX Bias Tape. This eliminates the excessive thickness which occurs at every sewed seam. It eliminates the weakness of the sewed seam. The seamless tape wraps more tightly and much more evenly. It is better insulation. VARTEX costs no more than sewed seam tapes. Try it!

NEW JERSEY WOOD FINISHING CO., INC.
FOUNDED 1907
ELECTRICAL INSULATION DEPARTMENT
Woodbridge New Jersey

3 ways bus operators can SAVE MONEY this winter!

1...Use Socony Special *plus* Ethyl: Perfectly suited to cold-weather bus driving. Makes motors run more briskly, more alertly. Burns clean, leaves a minimum of carbon. Reduces the amount of "choke" gasoline in your crankcase oil. **SAVE MONEY—TRY IT TODAY!**

2...Use the *New* Socony Motor Oil: In freezing weather it flows freely and gives instant lubrication, avoiding engine wear. Maintains the proper "body" at all temperatures. Results: perfect piston seal, maximum power, minimum fuel and oil consumption. **SAVE MONEY—TRY IT TODAY!**

3...Use Socony Winter Gear Oil: Avoid hard shifting gears and improper lubrication resulting when you try to make the summer grade of lubricant in transmission and differential do winter duty. Change to a winter grade of gear oil—just as you change to a winter grade of motor oil. Socony Winter Gear Oil is a superior lubricant especially made for cold-weather lubrication. **SAVE MONEY—TRY IT TODAY!**

STANDARD OIL COMPANY OF NEW YORK

"Phono-Electric"

FOR THE NEW ORLEANS TROLLEY-BUS OVERHEAD

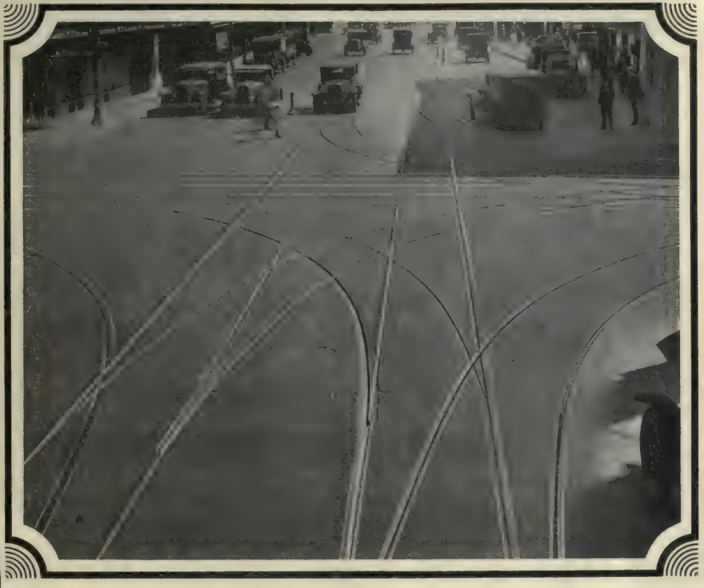
AFTER years of operation as the contact wire for the New Orleans Public Service Inc., Phono has been selected for the new trolley-bus installation of the company. High conductivity, tensile strength and resistance to stresses peculiar to this type of service recommend Phono alloys highly for such progressive development.

Phono, with the inherent strength and resistance to corrosion from exhaust gases, fogs and local conditions, is an economy in many units of the overhead—clips, clamps, bolts, nuts and hanger rods. Railway systems always find that it pays in maintenance and long service to standardize on Phono where conditions are most severe.

Write to Bridgeport Brass for complete data on physical properties and applications of Phono Alloys.

"Phono-Electric" Bronze Alloy TROLLEY & SPAN WIRE

BRIDGEPORT BRASS COMPANY General Offices, East Main St., BRIDGEPORT, CONN.



SAN ANTONIO'S NEW SPECIAL LAYOUT — *furnishes this sample of excellence in Lorain Track Specials*

Widening of South Alamo Street made it possible for the San Antonio Public Service Company to construct passing street-car curves in three directions, facilitating the movement of traffic through this important intersection. The three-quarter grand union layout is of the latest design. All the switch-pieces are solid manganese steel. Tracks consist of standard 103-pound rails, with welded joints.

THE LORAIN STEEL COMPANY

General Offices: 545 Central Avenue, Johnstown, Pennsylvania

Subsidiary of United States Steel Corporation

Sales Offices: **Atlanta** **Chicago** **Cleveland** **Dallas** **New York** **Philadelphia** **Pittsburgh**

Pacific Coast Distributors: Columbia Steel Company, Russ Bldg., San Francisco, Calif.

Export Distributor: United States Steel Products Company, 30 Church St., New York City, N. Y.

LORAIN

DeVilbiss Solves Your Problems

WHENEVER you have any spray-painting or spray-finishing problems, call the DeVilbiss representative. From his store of wide experience and complete knowledge, you can get practical aid and sound advice with no obligation on your part.

Every DeVilbiss man has a thorough knowledge of all the many phases of spray-painting and spray-finishing. He knows what *costs* should be; he can show you how to improve the *quality* of the finished work; he can advise you on *better methods* and how to *reduce production time.* Even in the chemistry of spray-painting and spray-finishing materials, you will find he has behind him a veritable mine of information in the DeVilbiss laboratories.

What you really buy from DeVilbiss is superior results at lower costs. DeVilbiss Spray-Painting and Spray-Finishing Equipment gives you these two vitally important things. That is why DeVilbiss Equipment is accepted as standard the world over; and why the DeVilbiss organization is recognized as the chief source of skilled knowledge on spray-painting and spray-finishing. That knowledge is available to you for your benefit.

NET PROFITS in 1931 will come from high operating efficiency and low operating cost. Let DeVilbiss help you get both in your spray-painting and spray-finishing operations.

DeVilbiss

THE DEVILBISS COMPANY · TOLEDO, OHIO

Sales and Service Branches

NEW YORK PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS CHICAGO
ST. LOUIS LOS ANGELES SAN FRANCISCO WINDSOR, ONTARIO

Direct factory representatives in all other territories

A question and a suggestion for 1931▲▲

Will your plans for 1931 track construction attempt to solve your maintenance problem definitely—adequately?

Why not bring this question out into the light—dust it off and ask yourself if it cannot be handled a little differently in 1931?

There are new angles to this old question that are worth your most careful consideration. There are ways and means of obtaining far more satisfactory results—and at less cost, too. Wouldn't it be worth while—even if we could not prove a single advantage over present methods, to at least get complete facts and figures on Dayton Ties—the simplicity of the Dayton Method—their correct principle—how they virtually wipe out maintenance costs—why they actually cost less per mile per year than any other tie, et cetera?

It won't cost a cent to get these facts—but it will save you money if you'll base your 1931 track construction program on them. And they are yours for the asking. Just send the coupon now.

THE DAYTON MECHANICAL TIE COMPANY
DAYTON, OHIO

If you care to give us a more detailed explanation of your 1931 program—it will enable us to be of special assistance in preparing more complete data.

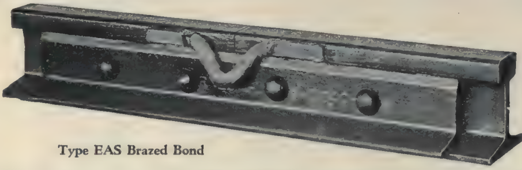
The Dayton Mechanical Tie Co.
Dayton, Ohio

Gentlemen:—

We are planning approximately . . . miles of track construction in 1931. We are at present using . . . type of track construction. How can you save us money?

Signed ....

Address..



Type EAS Brazed Bond

Not Just Rail Bonds...

Type EAS

Type EAS rail bonds are brazed to the rail using the portable welding furnace. The loop of these bonds may be offset at any angle, making the bond suitable for application to a wide variety of rail joints, including joints with heavily beaded splice bars. These bonds are supplied with a heavy brass sheath that grips the strands beyond the zone of the weld, thus effectively increasing the life of the bond.

but Voltage Boosters!

Faulty bonding means voltage leaks—lowered efficiency of the track return circuit—equipment running at less than full capacity.

Efficient bonding with Erico bonds brings voltage up to peak—keeps it there indefinitely, as once properly applied, Erico bonds are there to stay.

Erico bonds both reduce power costs and give full track circuit efficiency. There is a type for every purpose—all are easily applied.

Try them—write us your needs.

Over 30,000 lbs. were required to shear this terminal from the rail. The area of copper left on the rail from the shearing process, is just eight times the cross section area of the bond. Every individual strand is united to the rail in a solid braze which insures the maximum bond conductivity, without injury to either the rail or the copper of the bond.

The Electric Railway
Improvement Company
2070 E. 61st Place, Cleveland, Ohio

ERICO

RAIL BONDS AND BONDING OUTFITS

Illustration: The SIXTH STREET BRIDGE over Allegheny River at Pittsburgh, Pa., selected by a national jury appointed by AMERICAN INSTITUTE OF STEEL CONSTRUCTION as the most beautiful bridge completed in 1928.

The STRUCTURAL STEEL in the superstructure of this bridge was produced by Carnegie Steel Company, and FABRICATED and ERECTED by

AMERICAN BRIDGE COMPANY

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Chosen over all other types of
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The Perey Coinpassor

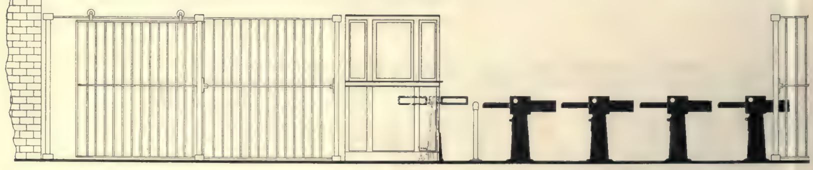
Two-way Type with Bullseye Coindetector

Perey Coinpassors, the Perey Coin Controlled Turnstiles, collect the fares (10 centavo pieces) in the new La Croze Subway in Buenos Aires, marking the first extensive use of coin controlled turnstiles outside of the U. S. They were adopted after a careful survey and analysis of fare collection methods on every rapid transit system in the world and are among the very few items of American manufacture chosen for use on this Subway.

These Perey Coinpassors are making good in Buenos Aires as they have in New York, Brooklyn, Philadelphia, Boston and other cities, wherever they are used.

Perey Heavy Duty Coinpassors are used in subway, elevated and rapid transit prepayment and post-payment stations, pay lavatories, etc. Perey Street Car Coinpassors are designed for fare collection on street cars and busses. Write us about your fare collection problems.

Perey Turnstiles (Perey Mfg. Co., Inc.) 101 Park Ave. New York


EMERGENCY EXIT GATE
CHANGE BOOTH WITH AUTOMATIC PEREY PASSIMETER
PEREY COINPASSORS - TWO WAY WITH BULLSEYE COIN DETECTORS

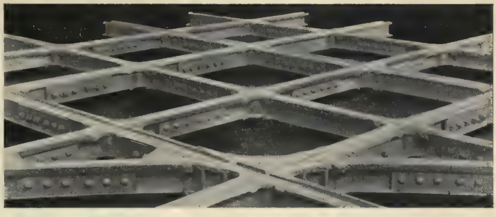
Reduce maintenance *with this* weldable trackwork

BETHLEHEM Silico - Manganese Crossings, Design 999, are intended for heavy-traffic locations. Installations at heavy-duty intersections have demonstrated the ability of Silico-Manganese Steel to stand up under the continuous pounding of modern electric railway cars.

Bethlehem Silico-Manganese Crossings have the hardness and toughness to resist wear. The Silico-Manganese Castings are Thermit welded to the rails, resulting in solid, one-piece construction and eliminating the use of cast iron or bolts. These castings are heat-treated to harden them and increase their wearing qualities. It is this heat-treatment that gives to Bethlehem Silico-Manganese Crossings their remarkable resistance to initial pounding and wear. They withstand great abuse and yet are easily repaired by any of the standard methods of welding, such as electric-arc, oxy-acetylene or Thermit.

Bethlehem Silico-Manganese Trackwork can be installed at all heavy-duty locations with confidence that it will stand up not only under today's traffic but under the still greater traffic volume of tomorrow.

Bethlehem Silico-Manganese Crossing and Turnout installed at a busy traffic intersection in a large eastern city.



Bethlehem Silico-Manganese Crossing assembled in Bethlehem's Frog and Switch Plant before shipment. Every crossing is assembled in well-lighted shops by careful workmen, assuring easy assembly and installation in the field.

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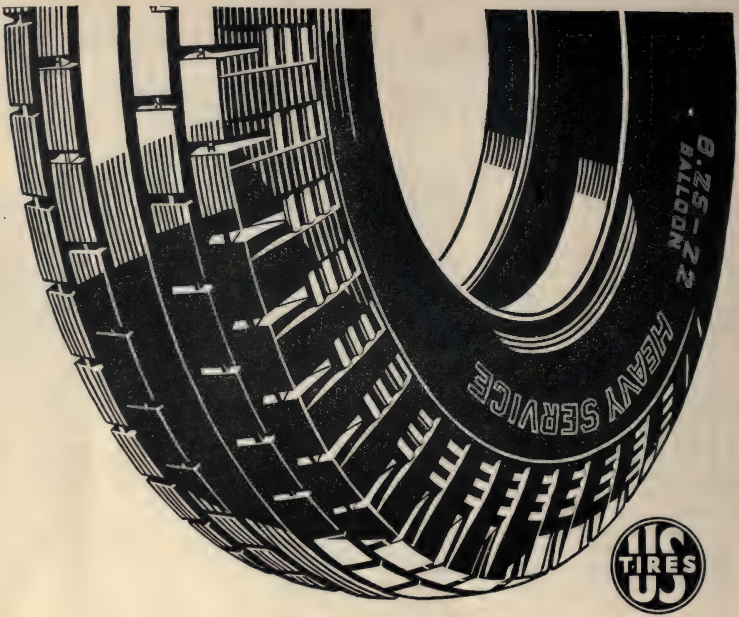
BETHLEHEM

Silico-Manganese Trackwork

Design 999



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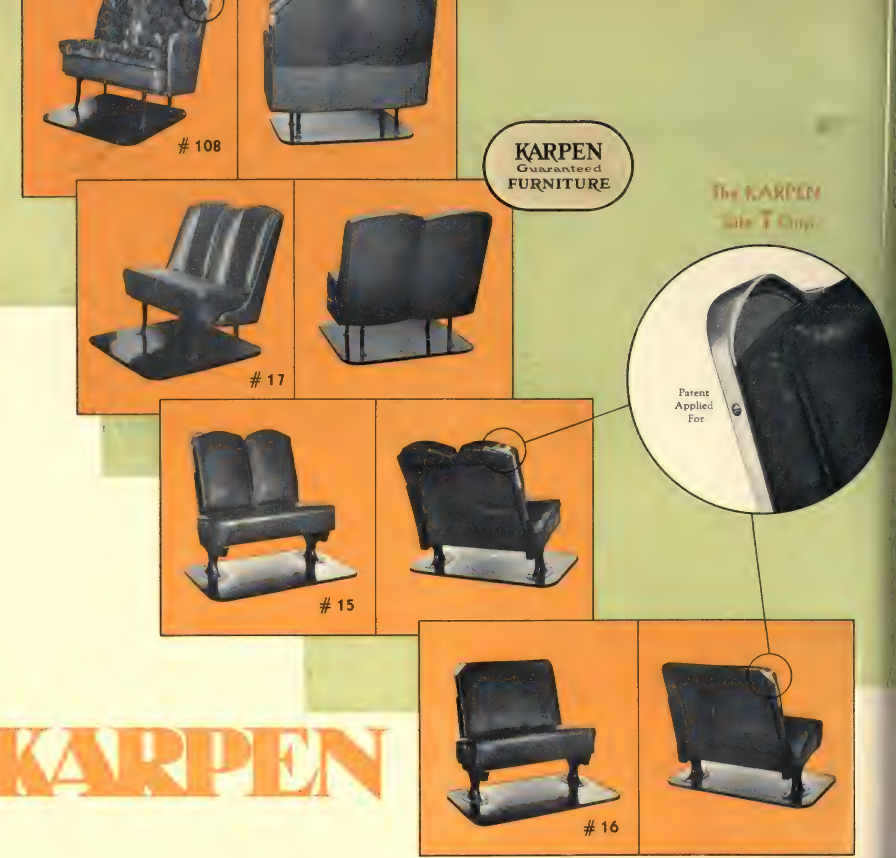

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KARPEN SEATS have behind them millions of miles of transportation seat building experience together with fifty years as leaders in furniture seating.

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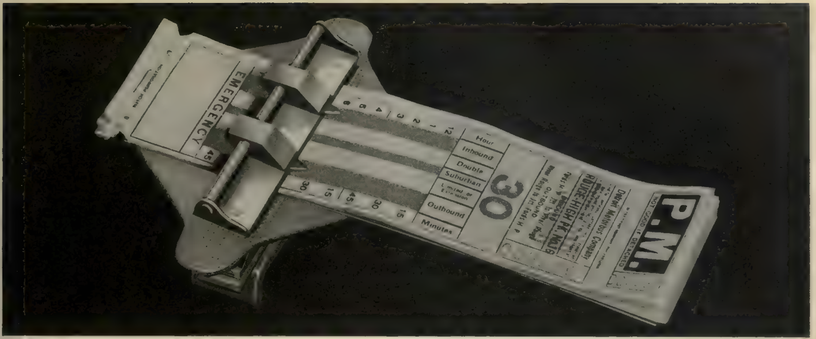

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The Hyman Cutter, illustrated, very efficiently aids in the operation of this transfer

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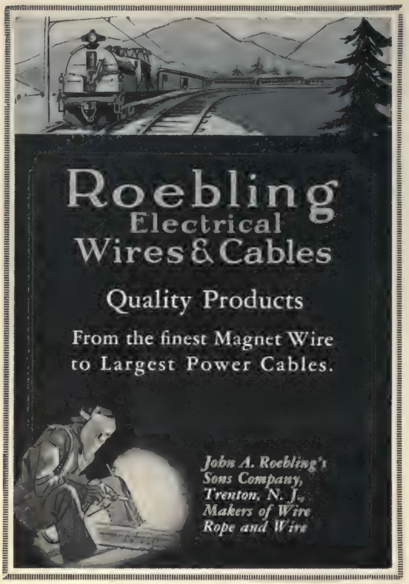

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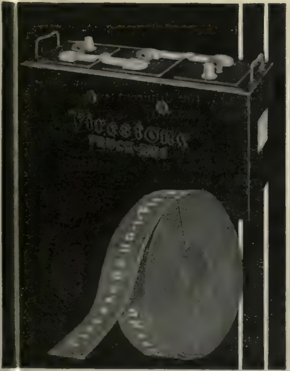
THREE times as many buses as they operated in 1926! Three times the mileage, amounting to more than three million miles. And yet since Firestone Gum-Dipped Truck and Bus Tires were adopted by the Washington Railway and Electric Company, four years ago, road delays have decreased from 254 a year to a mere 27—*having been practically eliminated.* During this time the bus miles operated per tire failure have been *increased from 7300 to 120,542*—an increase of over 16 times the average of 1926.

Firestone



WHAT truly amazing evidence of the rapid strides that Firestone has been making in the improvement of Truck and Bus Tires! What eloquent testimony to the results which are being secured by Firestone's careful supervision of the use and care of its products—not for just a single year or two—but continuously over a long enough period of years to make a real test. And all this is but one of the many similar cases where owners of the country's largest fleets are depending on the Firestone Organization for more economical, less interrupted fleet operation. With Firestone Tires, Tubes, Batteries, Brake Lining and Rim equipment, you can profit by the broad experience of the Firestone Dealer, in the proper adaptation and care of your Truck or Bus equipment.

Specify Firestone Gum-Dipped Tires and Firestone Rims when purchasing new equipment.

TIRES - RIMS - BATTERIES - BRAKE LINING

1931 Operating Costs can be lowered - - - - - - Boyerize!

Needless expenditures for labor and replacement parts are entirely eliminated if Boyerized Parts take the place of ordinary car parts. Boyerized Parts have three to four times the "service-life" of ordinary parts—reduce replacements 50 to 75%.

Many street railways have realized substantial savings by specifying these durable parts for replacements and on new cars. Make 1931 a year of profitable operation. Check the list. Send for quotations.

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The reason so many railways specify Silver Lake Trolley and Bell Cord is simply because this cord possesses lasting quality. It is durable, strong and economical. Only the best yarns are used in producing it.

A sample of Silver Lake Cord will convince you of its superiority—will give you an opportunity to test its strength. Write for this sample now.

SILVER LAKE COMPANY
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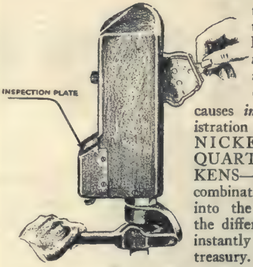
Fare Collection,

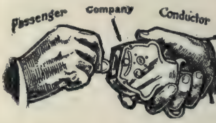


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS, or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



Money - Meters, Inc. **(Successor to Rooke Automatic Register Co.)**
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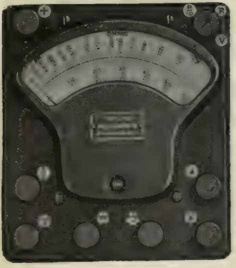

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Announces a *new* Instrument

Type PD
Direct Current
VOLT-OHMMETER

This instrument is a combination Circuit Tester, four range voltmeter and direct reading ohmmeter. Ranges up to 600 volts and 100,000 ohms.

It is recommended particularly for radio testing.

Size 4½" x 5" x 2⅝".

Scale is 3$\frac{5}{16}$" long.

There is included a special rheostat and a pair of special flexible cables with insulated test prods.

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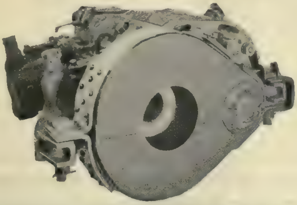

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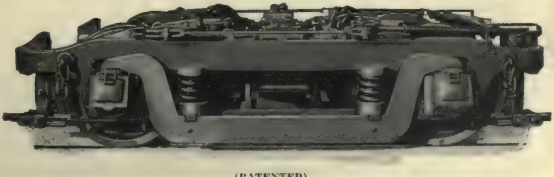

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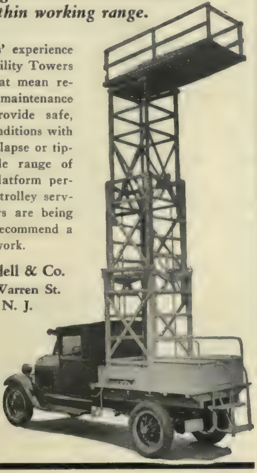

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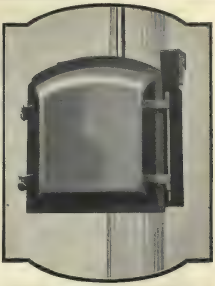
On Time



Schedules can be maintained with unfailing regularity when Nachod Headway Recorders automatically supervise the line. They tab, in print, the exact time that each car passes the points of installation, thus, giving you a daily report of all car movements. Simple in mechanism ... dependable ... durable. No adjusting ... just daily winding and change of record. Write for particulars and prices. Nachod & United States Signal Co., Inc., Louisville, Ky., Manufacturers of Block and Highway Crossing Signals.

"Nachod Spells Safety"

NACHOD *Headway* RECORDERS

"VELVELEA"

New effects and easy maintenance in a full grain leather

—a modern seat covering for transportation service, achieving effects not hitherto obtainable in leather—full grain in appearance, comfortable and soft. Originated to replace fabrics. Non-fading, durable and easily cleaned.

Samples on request.
America's Largest Producer

GENERAL LEATHER CO.
Newark, N. J.
Makers of the
Famous Tried and Proven "00" Leathers

Detroit Office:
General Leather Co.,
414 Fisher Bldg.

London Office:
R. & A. Kohnstamm, Ltd.,
21 West Smithfield,
London, E. C.

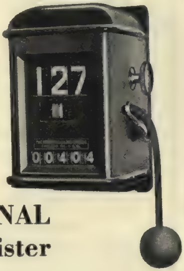
West Coast Office:
A. J. & J. R. Cook, Inc.,
237 Eighth St., San Francisco

Canadian Office:
Colonial Traders, Inc.,
277 William St., Chatham, Ont.

Collections Increase

when International Registers are installed

They stop leaks and time after time have brought gains in receipts of from 2 to 5%.



The R-13 INTERNATIONAL Bus Register

Combines the quality that has made International Registers famous for 40 years with

Low Cost
Convenience
Long Life

It is sent on free trial.

Write for details.

INTERNATIONAL REGISTER COMPANY
11 South Throop St., Chicago

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or SPECIAL

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch $6.00
2 to 3 inches.............. 5.75 an inch
4 to 7 inches.............. 5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. **R.J.**

COPY FOR NEW ADVERTISEMENTS ACCEPTED UNTIL 3 P. M. ON THE 20TH FOR THE ISSUE OUT THE FIRST OF THE FOLLOWING MONTH

---

3 FACTORIES FOR SALE

SYRACUSE

TWO FACTORY BUILDINGS WITHIN THE ONE MILE LIMIT FROM CENTER OF CITY.

BUILDING NO. 1.—3 stories . . . Brick construction 300 ft. long x 80 ft. wide, 79,200 sq. ft. manufacturing space.

BUILDING NO. 2.—2 stories . . . Brick mill built. 260 ft. long x 70 ft. wide, 36,400 sq. ft. manufacturing space.

Both buildings completely sprinkled. Also a store house, frame construction, of 30,000 sq. ft. 5 Grand Rapids Dry Kilns, each holding 8,000 sq. ft. lumber. In addition a 2 story office building of brick, with approximately 6,400 sq. ft. floor space. 1-250 H. P. Ames Boiler—1-125 H. P. Skinner Engine. STEAM HEATED PLANT—ELECTRIC POWER—COMPLETE FIRE PROTECTION. N. Y. CENTRAL R. R. SIDING ON PREMISES WITH SHIPPING CONNECTIONS OVER D. L. & W.

◆

BALTIMORE

THREE FACTORY BUILDINGS WHICH CAN BE PURCHASED AS A WHOLE OR SEPARATELY WITH RAILROAD SIDING FOR EACH BUILDING LOCATED AT S. EUTAW & W. WEST STS.

UNIT No. 1—Five story and basement building and a two story building adjoining, both of solid brick construction. Total floor space 104,479 sq. ft. 100% Sprinkled. Steam, Elevators, Electric Power.

UNIT No. 2—Three five story brick buildings, connected with openings on each floor. Electric elevators in two of them. Floor space 86,200 sq. ft. Also included are veneering plant, dry kiln, boiler house and 60,000 gallon water tank on iron supports.

UNIT No. 3—This part of property has been used as a lumber yard. Total land area 20,493 sq. ft.

TRANSPORTATION—3 Trunk Line Railroads. The B. & O., Penn., & Western Maryland R. R., all having deep water facilities.

◆

BOSTON

MODERN FIVE STORY AND BASEMENT REINFORCED CONCRETE and FIREPROOF THROUGHOUT, LOCATED AT ROXBURY CROSSING STATION ON THE MAIN LINE OF THE N. Y., N. H. & H. R. R. Building has approximately 20,700 sq. ft. net manufacturing space on each floor, plus 9000 ft. each in basement and grade floor, totalling 142,000 sq. ft. net. Equipped with WEBSTER Vacuum Reduction Heating System. Engine room adjoining boiler room can accommodate a 225 H. P. Engine. Three freight elevators with 2 ton capacity.

One story garage building having an area of 25,000 ft. net with independent heating plant. Factory will be sold with or without garage building.

Write or wire for Complete Information

RIKER & CO. INC.
Realtors
201 MONTAGUE ST.
B'KLYN, N. Y. Phone TRiangle 1234

POSITIONS WANTED

ARMATURE winder well experienced with railway equipment desires change. Reference. PW-217, Electric Railway Journal, 883 Mission St., San Francisco, Calif.

ARMATURE winder, well experienced with railway equipment, desires change. References. Go anywhere. PW-238, Electric Railway Journal, 883 Mission St., San Francisco, Cal.

GRADUATE electrical engineer, age 34, with 11 years' experience in electric railway and gas industry, desires connection with operating company. Experienced in construction work, operation of transportation and mechanical departments and investigation of methods used with recommendations for improvement. Present work will be completed about January 1st. PW-237, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

MASTER mechanic, now employed desires change. Good reference. Experienced interurban, city car and bus maintenance and overhauling. PW-227 Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

Electrolysis Methods of Computation and Equipment

A method of computation of the results of electrolysis surveys that is accurate and easy of solution and which is based on Ohm's law, is offered for sale.

This method, I am confident, is not possessed by anyone else and only in rare cases is it necessary to make elaborate potential gradient surveys on street railway systems.

Put into use by a corporation of associated utilities, it will save its cost in two years and give more definite results.

For full particulars address

KING G. KELLOGG
1033 West 51st St., Los Angeles, Calif.

FOR SALE
1000 K.W.
SYNCH. MOTOR GEN. SET

Modern type Westinghouse 575 v. D.C., 3 ph., 60 cy., 2,200 v., .8 P.F., A.C. 900 r.p.m. Motor Generator Set with Dir. Conn. Exciter and complete A.C. and D.C. Switchboards. Condition 95% New.

JOHN D. CRAWBUCK COMPANY
Empire Bldg., Pittsburgh, Pa.

---

125 tons New but rusty
72 lb. 6 in. High "T" Rail
60 and 62 ft. lengths
ZELNICKER IN ST. LOUIS
at less than Mill Price

Over 6000 other men in the Electric Railway Field will see this page

Then—isn't this the logical place to advertise any business wants you may have of interest to Electric Railway men?

EMPLOYMENT
BUSINESS
or
EQUIPMENT
OPPORTUNITIES,
Etc., Etc., Etc.

FOR SALE

as a going concern

PHILADELPHIA RAILWAYS CO.

only independently owned electric railway in the City of Philadelphia

Perpetual franchise, 15½ miles of track, including LINE TO HOG ISLAND (new airport development), 15 cars, snow plow, sweeper, complete modern 1,000 K.W. sub-station and car barn including valuable real estate with river frontage.

Will deliver entire issue of $400,000 capital stock and $400,000—five per cent First Mortgage Bonds, due 1941, with no other indebtedness; or will be sold free and clear of all mortgage and other indebtedness. BUS FRANCHISE may be secured for extensions or branches. Address

PHILADELPHIA RAILWAYS CO.
606 Land Title Building - - Philadelphia, Pa.

DISMANTLING?

Let us handle this for you. We specialize in buying and dismantling entire railroads, street railways, industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.

Consult us also about New and Relaying Rails—all weights and sections. You will like our service.

The Perry, Buxton, Doane Company
(Capital $1,000,000.00)
Boston Office, P. O. Box 5253, Boston, Mass.
Pacific Sales Office—Failing Building, Portland, Oregon

ROTARY CONVERTERS

2—300 KW. Rotary Converters, Interpole ventilated type, 6 phase, 600 volt, with transformers and switchboard equipment.

Virtually New

FS-236, Electric Railway Journal
Tenth Ave. at 36th St., N. Y. C.

TO HELP YOU

SELL WHAT YOU NO LONGER NEED

"Searchlight" Advertising

FOR SALE

Economy Power Saving Meters

in good operating condition; 100, 150, and 200 ampere. Price very low. Communicate with

THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY
Public Service Bldg., Milwaukee, Wisconsin

Track Dismantling

We dismantle electric, steam and industrial railroad trackage with neatness and dispatch. Can save you money. Wire or write

A. DUIE PYLE CONTRACTING CO.
1223 Widener Bldg., Philadelphia, Pa.

Even when the "Old Skipper" of the "Toonerville" line is ready to sell out—

he'll find that we'll make a most attractive offer for the complete system or any part of it! We specialize in the buying of surplus steam or electric railway equipment of any description—anywhere!

Where we buy your system in its entirety we dismantle. Our expert dismantling crew handles the work quickly and without trouble to you.

Get our "spot cash" quotations on your surplus cars, poles, trackage, power house equipment, etc. Send a list of your equipment today—liquidate those frozen assets!

RELAYING RAIL
Considerable tonnage available for immediate disposal!

GORDON AND GERBER
330 THIRD ST., CHELSEA, MASS.

Rolling stock in the repair shop adds no profits

IN 1931 let us help you speed up repairs and get cars and buses back into service more quickly, because rolling stock in the repair shop adds no profits to the balance sheet.

Operators of surface lines and buses have discovered that one sure, certain way to lower maintenance costs is to use Oakite materials and methods. Exacting tests have proved that these modern materials clean quickly and effectively and are safe to use and handle. In addition, and equally important, is the fact that these materials are economical to use.

In 1931 take advantage of the practical and wide experience of Oakite Service Men and make it a part of your maintenance personnel. All users of Oakite materials are entitled to this service, without cost or expense. It is a service that has enabled many electric railway companies to save considerable money and improve their maintenance work.

Tell us your problems or ask for our Service Man in your locality to call.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG. U.S. PAT. OFF.
Industrial Cleaning Materials and Methods

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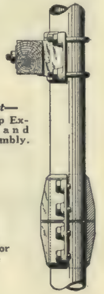
1931 Maintenance—Poles, Etc.

Many tubular steel poles, normal maintenance of which was deferred from 1930 as not being immediately necessary, should now be brought back to original strength for many more years with M.I.F. Reinforcing and Extension Clamps.

Their cost, installed, is less than for comparable results by other methods, whether used for corrosion at ground-line or at upper joints.



At right—"C" Clamp Extension and Gain Assembly.

At left—"C" Clamp for Ground-line Corrosion.

Sizes in stock for all standard poles. Poles of unusual lengths for temporary construction operations, etc., not ordinarily available, may be assembled from standard poles and extra length of pipe, using these Clamps.

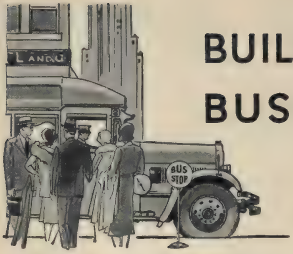
Specify Williams Pole Mounts for the special job of mounting poles, tubular steel or wood, on rock, concrete, bridges, etc.

Sales Bulletin No. 3 covers the above. Send for it.

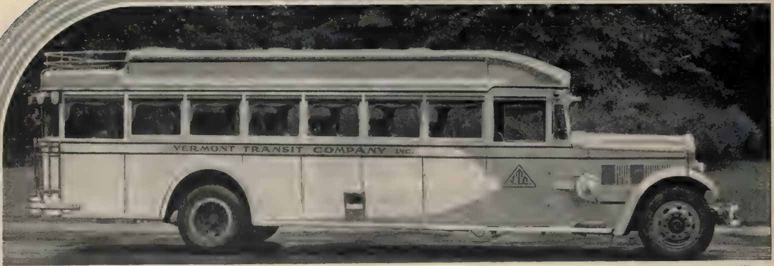
Insulated Suspension Hangers for signal conductors, etc., as illustrated above, merit your consideration also—as well as our popular Guy Hooks and accessories, Crossarm Gains for wood and tubular poles, Aerial Cable Suspension Clamps, Catenary Clamps, H-Column Mounts, etc.

Send for data, samples, etc.
We feature Engineering Service for special jobs.

MALLEABLE IRON FITTINGS COMPANY
Pole Hardware Department
Factory and New England Sales Offices:
Branford, Conn.
New York Sales Office:
Thirty Church Street
Canadian Mfg. Distributor:
LINE & CABLE ACCESSORIES, Ltd., Toronto



BUILDING BETTER BUSINESS WITH BENDER BODIES



This 29-passenger Bender Coach can have an auxiliary seating arrangement, building the total up to 36.

By reason of these four distinctive features:

1 APPEARANCE

Body lines and colors that attract passengers. Rider appeal.

2 DURABILITY

That keeps the bus on the road, day in and day out.

3 COMFORT

That makes first time riders regular passengers because of the easy riding qualities, commodious interior and other conveniences.

4 SAFETY

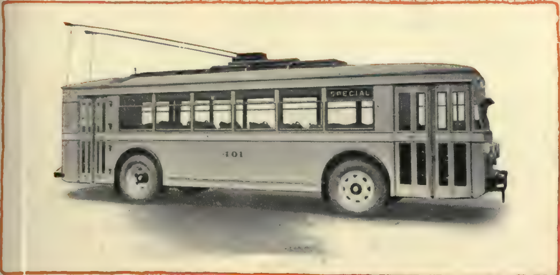
That comes from Bender advanced principles of design and construction.

•

THE BENDER BODY COMPANY
W. 62nd and Denison CLEVELAND, OHIO

Note the commodious, comfortable interior with spacious overhead luggage racks.

B·E·N·D·E·R··B·O·D·I·E·S



Now Rockford

Chicago's trolley bus installation has attracted considerable attention. More and more the trolley bus is gaining recognition as the ideal type of vehicle to supplement electric car service in larger cities and to provide modern transportation in smaller communities.

Rockford, Ill., is the latest installation of Brill 40-passenger trolley buses. Knowledge of the success of the modern trolley bus is spreading. Investigate its possibilities. Write for complete information.

The J. G. BRILL COMPANY
HARRIS TRUST BUILDING CHICAGO
PHILADELPHIA
RIALTO BUILDING SAN FRANCISCO
AMERICAN CAR CO., ST. LOUIS • THE G. C. KUHLMAN CAR CO., CLEVELAND • WASON MFG. CO., SPRINGFIELD, MASS.

Brill Trolley Buses Win—

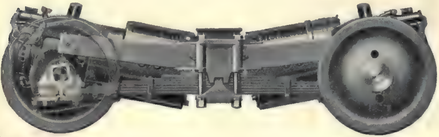
HOUSTON
TEXAS

ELECTRIC AT-TRACTION

How much better and more profitable it would be if people really enjoyed riding in street cars; instead of using them—as so many do—merely as the most convenient or only available transportation!

Change Electric Traction to Electric Attraction. Equip your cars with Timken Worm-Drive Trucks. Let them supply the magnetic force to attract and hold more riders.

Timken worm-drive cars are quiet, smooth, comfortable. A real treat awaits passengers riding for the first time on Timken equipment. And Timken Trucks are of lighter weight—smoother in pick-up and stopping—faster on straight-away. They cut operating and maintenance costs.



THE TIMKEN-DETROIT AXLE CO.
DETROIT MICHIGAN

DTA CO

TIMKEN *Worm Drive* TRUCKS

FOR · ELECTRIC · RAILWAY · CARS

LIBRARY,
TEXAS

ELECTRIC RAILWAY JOURNAL

raw-Hill Publishing Company, Inc. FEBRUARY, 1931 Thirty-five Cents per Copy

FARGO
BUILT BY CHRYSLER MOTORS

60 OR MORE RIDERS Wherever shown, wherever operated, the original, advanced Fargo Model 90 Street Car Coach has won sustained approval. In actual service it has proved its ability to carry comfortably more than 60 riders . . . to pull such capacity loads up exceptionally steep grades . . . to maintain a fast schedule while doing so . . . and to serve dependably at low cost.

For Complete Information, Write to

FARGO MOTOR CORPORATION
DETROIT, MICHIGAN
A DIVISION OF CHRYSLER CORPORATION

If horse cars returned Brooklyn would need 123,480 horses to replace 2,352 Westinghouse Motors

One of the Westinghouse-equipped Brooklyn and Queens cars placed in service last year.

LAST YEAR 100 Westinghouse-equipped cars were added to the lines of the Brooklyn and Queens Transit Corporation. A recent order for 50 additional Westinghouse-equipped cars of the same type brings the total number of Westinghouse 510, 35-hp. motors to 2,352. If horse cars returned, in order to supply this total power, at the actual average power a horse can exert, would require the tremendous number of 123,480 horses.

Even as remarkable as the modern car is over the horse car so is Westinghouse Variable Automatic (VA) Control over other controls for providing rapid and smooth rates of acceleration for city service.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31684

TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

ELECTRIC RAILWAY JOURNAL

MORRIS BUCK
Engineering Editor
GEORGE J. MACMURRAY
CLIFFORD A. FAUST
J. W. MCCLOY
LOUIS F. STOLL
Publishing Director

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

Vol. 75, No. 2

JOHN A. MILLER, JR., *Editor*

Pages 63-118

JOSEPH R. STAUFFER
Chicago
PAUL WOOTON
Washington
W. C. HESTON
Pacific Coast Editor
ALEX MCCALLUM
London, England

Our Problems

As Others See Them

URBAN and interurban transportation more than almost any other industry touches the lives of a vast number of people. Often a keen observer not directly connected with the transportation business is in a position to make valuable suggestions for the solution of its problems. For this reason, the Journal is planning to publish during the coming year a series of articles by nationally known men outside of our own industry.

Among those who will contribute to this series are:

Dr. Julius Klein

Assistant Secretary of Commerce, whose experience with the problems of business and industry is world wide.

Frederic A. Delano

chairman of Regional Plan of New York and Environs; formerly president of the Wabash Railroad and a member of the Federal Reserve Board.

Edward Kimball Hall

lecturer on industrial relations in the Amos Tuck School of Business Administration at Dartmouth; formerly vice-president American Telephone & Telegraph Company; the man who inspired "the voice with a smile."

Col. A. B. Barber

manager transportation and communication department, U. S. Chamber of Commerce; director National Conference on Street and Highway Safety.

Joseph H. Appel

of the John Wanamaker Company, New York, who has given intensive study to the relationship between transportation facilities and retail trade.

The first article of the series will appear in the March issue

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AERA
1931

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CHICAGO, *520 North Michigan Avenue*
PHILADELPHIA, *1600 Arch Street*
CLEVELAND, *Guardian Building*
BOSTON, *1427 Statler Building*
GREENVILLE, S. C., *1301 Woodside Building*
DETROIT, *2-257 General Motors Building*
ST. LOUIS, *Bell Telephone Building*
SAN FRANCISCO, *883 Mission Street*
LOS ANGELES, *632 Chamber of Commerce Bldg.*
LONDON, *6 Bouverie Street, London, E. C. 4*

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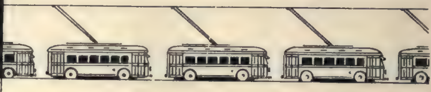
Avenues



61

Westinghouse-equipped
Trolley Buses

In the last 9 months, the Chicago Surface Lines have placed in service 61 Westinghouse-equipped Trolley Buses—29 in April, 7 in June, 15 in September and 10 in December.

Such repeat orders are surely a proof of the success of the Modern Trolley Bus and of the operators' confidence in Westinghouse equipment.

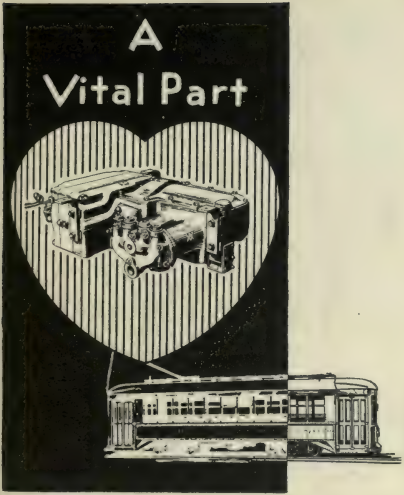
Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

WESTINGHOUSE ELECTRIC

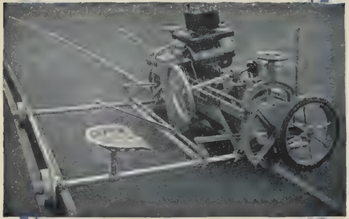
T 31670

TUNE IN THE WESTINGHOUSE SALUTE OVER N. B. C NATION-WIDE NETWORK EVERY TUESDAY EVENING

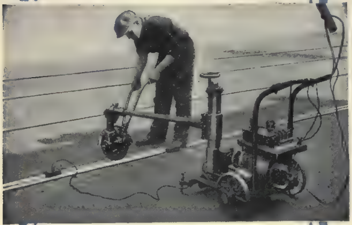


The air compressor is an integral part of every air brake equipment—and VITAL . . . Just as the heart functions to pump life blood through a human organism so does the compressor provide vital "fluid" for actuating the brake . . . Westinghouse compressors have no "organic" defect, require only reasonable attention to avert "functional" trouble, and, if kept in normal health, will need no "doctoring" to assure a long and useful life . . . The DH Compressor, built in four sizes, 10, 16, 20, and 25 cu. ft., displacement is noted for its compact design, light weight, accessibility, and dependable performance . . . For extremely light weight requirements, compressors made of aluminum are available . . . WESTINGHOUSE TRACTION BRAKE CO., General Office and Works, Wilmerding, Pa. » » » » » »

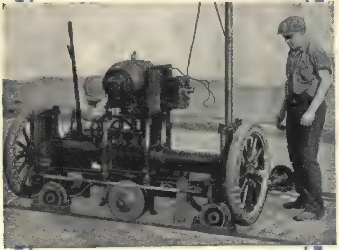
WESTINGHOUSE TRACTION BRAKES



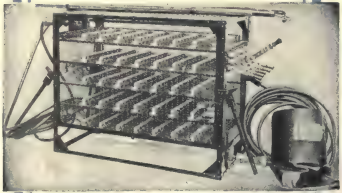
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

By all means advertise, but—

Advertise your road by all means. Good advertising will pay you well—in bettered goodwill, increased business, improved personnel. But—lest someone forget—good advertising requires a good product. Only a worthy product can be successfully advertised. Your product is service. How good is it?

Do your fine new cars run silently, swiftly and smoothly over well-kept rail? If so, all's well. If not—here is the equipment for economically producing and keeping good rail.

Good rail is the actual, literal foundation of good service. With it you can advertise successfully.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. LaSalle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

5268

Reciprocating Track Grinder

Vulcan Rail Grinder

Reciprocating Grinder Car, showing one of the grinding units.

RTW Curve Oiler

WATCHING EAR COSTS DIMINISH

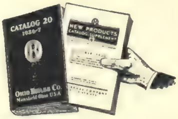
ALTHOUGH there are indications that passenger revenues will increase steadily, progressive properties are not depending entirely upon increased traffic for larger earnings in 1931. Many are realizing that savings in operating expense—every dollar of which equals the net income received from 250 or more passengers—*are* possible; particularly through the use of O-B Line Materials.

Take the *Improved* Marathon Ear for example. Properties using this ear report that it even excels the original (but now superseded Marathon) which had service records of 350,000 car passes and more; which doubled, trebled and even quadrupled the service received from other ears.

Because of the tapered ends of the *Improved* Marathon, longer wheel life may be expected, as well as a reduction in wire breaks, and a decrease in service interruptions. The resultant savings amount to thousands of dollars yearly in several instances and immediately convert themselves into net profits.

Improved Marathon Ears can be depended upon to do their part in reducing operating costs, just as well as other O-B line material devices. By cutting down operating costs 1%, net profits jump up almost 20%. And there is no better place for slicing off a sizable chunk of costs than in the maintenance of the overhead.

Take advantage of the opportunity for replacing worn out ears with *Improved* Marathons. Then watch your ear costs diminish.



New Products Supplement No. 4 to O-B Catalog No. 20 will gladly be sent to any one wishing a copy.

WESTERN RECORDS REVEAL BOND THRIFTINESS

TO ONE who has thoroughly analyzed such factors as homogeneousness of the weld, resistance of the rail joint, life of the bonds, etc., and is still doubtful as to his bond preferences, the figures recently given out by a western property may prove helpful. These figures are important as they bear directly upon those factors which determine the dollars and cents economy of the bond.

The property in question, in order to gain information for future guidance, kept accurate records of the cost of installing various types of bonds on a new extension. Among others, 3000 Una Bonds, 4-0 capacity, were installed. These were applied at the average rate of 90.91 bonds per day. The items making up the total cost were:

Cost of Bonds - - -	$36.00 C
Cost of Material - - -	15.84 C
Cost of Labor - - -	11.58 C
	$63.42 C

One reason for these low installed costs of Una Bonds is that it is almost impossible to do a poor job of welding by the Una method. The skill of the operator is of less importance than the process, for the O-B Una process of electric welding with Duron welding rod is such as to expel the gases from the molten metal, thus eliminating gas bubbles and porosity, a common source of inferior welds.

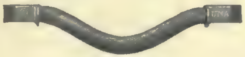
Any desired data on O-B Una Bonds, or samples of the bonds, will be gladly supplied those wishing to make their own tests.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co. Limited
Niagara Falls, Canada
1961LB

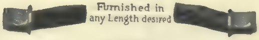
CUA Una

MCUA Una

LUA Una



CL Una



CBA Una

Ohio Brass Co.

PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

GRADUALLY the momentum towards prosperity grows. As more people are employed—more ride the electric railway cars to work and back—more read the car card advertisements and buy, making work for still more hands to do—again more riders—these newly busy hands must also travel to and fro.

Collier Service car cards are an important link in the chain that is pulling for prosperity and helping to increase the traffic on the electric railway lines.

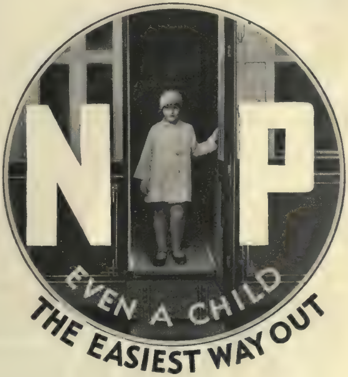
"CAR CARD ADVERTISING ALMOST EVERYWHERE"

BARRON G. COLLIER INC., CANDLER BLDG., N. Y. C.

NP

TREADLES for the Progressive South

● The Tennessee Public Service Company recently purchased ten new, thoroughly modern, one-man cars ● National Pneumatic Door Control, including the N. P. Automatic Treadles, permits the *safe* operation of these cars under the highly efficient "circulating load" method of passenger interchange ● Residents of Knoxville are saving time by using the treadle exit door. » » » » » » » »



NATIONAL PNEUMATIC COMPANY

Are

AN OUT
ON YOUR 1931
BUDGET

New interesting data from a certified time study boiled down to 20 illustrated pages of methods and figures that can be used for comparison with your 1931 track budget estimates.

Three track designs for light, medium, and heavy city service with corresponding detailed costs from $4.89 to $7.18 per single track foot.

—Abstracts from 22 letters from leading track engineers on the costs and merits of vibrated steel tie track.

THE INTERNATIONAL

CLEVELAND

you interested in

SAVING $3. TO $5.

PER FOOT OF PAVED TRACK ?

Then Send For This Book

CERTIFIED to the point of a legal document—here is a book that shows how to cut the track budget $3 to $5 per foot—and get better track.

Certification is by a group of inspection engineers, well known in the street railway field. It is an absolutely unbiased record of a detailed time study of paved track cost with steel Twin Ties and International Mechanical Methods.

It proves that you can save by using the Track Layer—the Bolt Tightener—and the Mortar-Flow Pulsator.

Operating executive or track engineer—both have a vital interest in the valuable money saving data and new methods presented in "CERTIFIED PAVED TRACK COSTS." It will be gladly sent on personal inquiry, to interested officials.

STEEL TIE COMPANY

·OHIO·U·S·A·

KEYSTONE CAR AND BUS EQUIPMENT...

Modern cars are efficient, fast and safe only because of perfection in the many parts of which they are made.

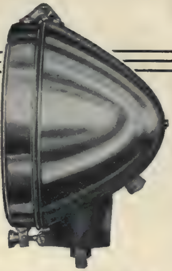
Keystone Car and Bus Equipment contributes a great many of the accessories found on present modern vehicles.

The Keystone Reputation is as old as the industry itself.

The Keystone Bus and Electric Railway Catalogs, No. 9 and No. 7 respectively, are complete buying guides for this equipment, containing thousands of items necessary for building and modernizing rolling stock.

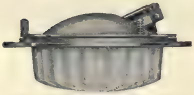
REMEMBER—No. 9 for Bus Equipment
No. 7 for Car Equipment

Type T Lighting Fixtures



Golden Glow Bus Headlight

Golden Glow Railway Car Headlights



Dome Type S Keystone-Ivanhoe Fixture

Type O.D. De Luxe Keystone-Ivanhoe Bus Fixture

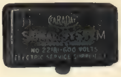
Keystone Trolley Catchers

Typical Hunter Illuminated Sign

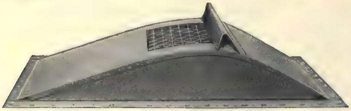
Faraday Buzzers

Faraday Push Buttons

Faraday Car Signal System, Resistance



Type 129 Hunter Sign—mechanism



Keystone Roof Type Bus Ventilator

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District office at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK; Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver.

G-E-Glyptal
REG. U.S. PAT. OFF.

solves INDUSTRIAL PROBLEMS *everywhere!*

. . . and it may solve the problem that is troubling you.

Is yours a problem of obtaining a protective coating that will resist acids, alkalis, brine, fumes, heat or corrosion?

Or one of obtaining a reliable primer? A primer that will surely protect and cling tenaciously to the surface to which it is applied.

Have you a satisfactory material for sealing water, oil or gas leaks?

Is yours a problem of obtaining a suitable sizer?

Or of finding a good cement or bonding material?

Perhaps it is an insulated coating in which you are interested?

WHAT IS YOUR PROBLEM? Write Section M-312 Merchandise Department, General Electric Company, Bridgeport, Connecticut, and let the General Electric Research Laboratories work with you.

GLYPTAL

is "Four-fold Liquid Armor" because it

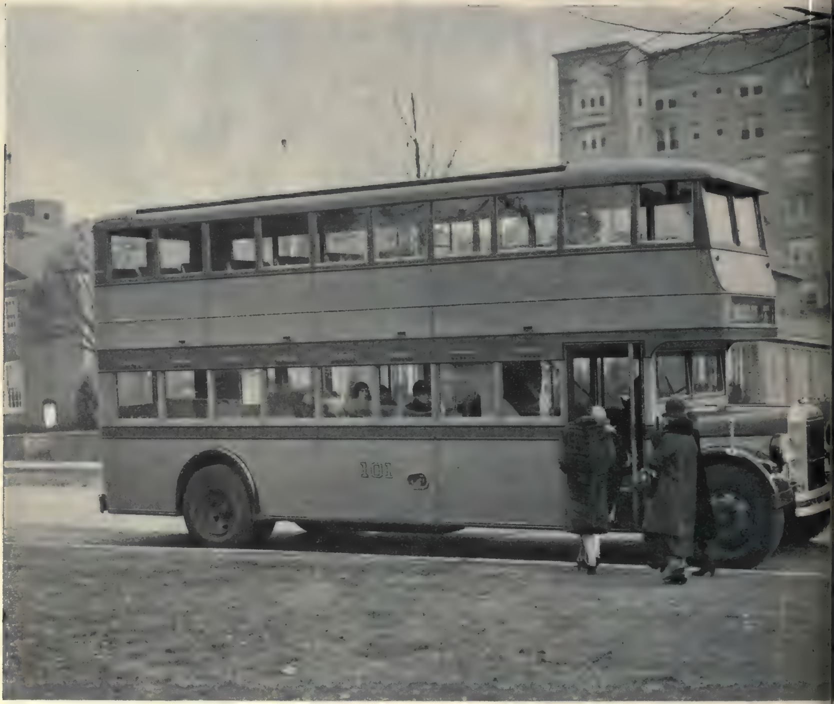
1. Primes
2. Sizes
3. Seals
4. Protects

GENERAL ELECTRIC

Glyptal

MERCHANDISE DEPARTMENT · GENERAL ELECTRIC COMPANY · BRIDGEPORT, CONNECTICUT

G-E Electric Drive Is



One of twelve 69-passenger, double-deck buses operated by the Baltimore Coach Company. G-E electric drive makes possible safe, efficient operation with one man

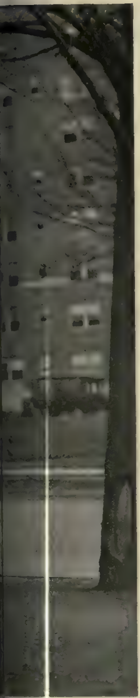
Join us in the General Electric program, broadcast every Saturday evening on a nation-wide N. B. C. network

THESE data were compiled from information contained in A. E. R. A. Bulletin, No. 333. They further emphasize the fact that G-E electric drive is becoming more and more desirable with the increasing use of large-capacity buses, especially in heavy city traffic. G-E electric drive eliminates the clutch, transmission, and differential; its torque is much smoother than that of a sixteen-cylinder engine, and free wheeling is an inherent characteristic.

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Meeting the Demands of Heavy City Traffic



In city service
359 railway companies
operate 5,778 buses of
29-passenger capacity
or more

36%

are G-E electric drive

The same companies
operate 1,065 buses of
35-passenger capacity or
more and of these

62%

are G-E electric drive

390-70

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

Gas-electric Drive Is General Electric Drive

THE MODERN electric transmission for buses is distinctly a General Electric development. Although experiment began as early as 1903, when the first gas-electric bus in America was placed in service, not one year has passed without the application of General Electric equipment to some form of automotive drive. Since 1925, approximately 2300 G-E equipped buses have been placed in service and, in step with the advances in automotive design, the performance of General Electric equipment has also been improved. During the last five years, the weight per horsepower output has been reduced by 35 per cent.

Forty years' experience in the manufacture and application of transportation equipment, unequaled facilities for research, and a huge investment in manufacturing equipment have combined to make possible General Electric's comprehensive and reliable service to the transportation industry.

390-69

GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

New York,
February, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 2

Car Research Enters Active Phase

ACTIVE research work under the auspices of the Electric Railway Presidents' Conference Committee has now begun. Brooklyn has been selected as the field laboratory. Data will be collected concerning all aspects of car performance. The first step in the program will be to evaluate that which is now available. Experimental cars already built for service on a number of different properties will be brought together, and their performance measured under identical conditions. Not only will this afford a common basis of comparison for various existing types of equipment, but it should also encourage manufacturers in the development of new equipment, the performance of which will be assured of effective test at minimum cost.

Problems facing the committee's engineers are numerous and complicated. In the past, investigations have been conducted along some lines similar to those which it is proposed to follow now. Other subjects of research lie in virgin territory. For example, a way must be found to compare the riding qualities of different types of cars. Before the collection of data can begin, however, it will be necessary for the engineers to devise yard sticks for measuring several factors in car performance. After the units of measurement have been defined, instruments must be prepared for recording them. All this involves a vast amount of painstaking work.

It is realized by the committee that tests made on any one property cannot cover the whole range of operating conditions. Many facts of great importance, however, can undoubtedly be established by the research program to be carried out at Brooklyn. Later it is planned to extend the work to include investigations under other conditions.

The research work in car design now getting actively under way is in line with what other progressive industries are doing. That the electric railways did not undertake something of this kind years ago probably accounts for some of their present difficulties. The fact that this investigation is being conducted under the auspices of the Presidents' Conference, however, does not mean that the individual railways can afford to sit back and postpone indefinitely necessary car replacements. A considerable time must necessarily elapse before the committee's research work can be translated into actual car design. In fact, the initial stage of this work will probably be to define the characteristics which a car should possess rather than to design a standard vehicle.

It is hardly likely that an ideal car which will meet the needs of all electric railways can ever be developed. The committee's objective is merely to approach this ideal as closely as is practicable. Nor is it the committee's intention to stifle the independent effort of manufacturers of cars and car equipment. Quite to the contrary. As explained by Dr. Thomas Conway, Jr., chairman, at the San Francisco convention, the committee proposes to work with, and through, the manufacturers. In so doing, it will utilize existing experience and ideas in achieving its objectives. But it will also be in a position to co-ordinate and guide the work of the many groups interested in car development, and to define the objectives being sought.

In the meantime, the industry must proceed with the replacement of obsolete equipment, making use of the data developed by the committee as fast as it becomes available. Any other policy is unthinkable. Not only is it unwise to continue operating obsolete, heavy and expensive cars longer than is absolutely necessary, but if normal replacement business is not provided to manufacturers during the next several years, the Presidents' Conference Committee will be seriously handicapped in its effort to stimulate further developments and improvements.

▼

Indianapolis Appears to Be Courting Municipal Ownership

REJECTION by the city of Indianapolis of the proposed service-at-cost franchise submitted to it in December by the Midland United Company on behalf of the owners of the Indianapolis Street Railway has been followed by a statement by the Mayor's committee to the effect that the rejection does not mean that a proper solution for the existing situation may not be found. That, of course, may be true, but it will be difficult for unprejudiced observers to believe that municipal ownership offers a solution despite the assurance that it would be free from political control.

The Mayor's committee may have the best of intentions, but how is the city to have municipal ownership under proper safeguard free from political control? Bad causes frequently have excellent counsel, while the cause still remains unsound. If it be true that the object of the city is to secure first-class transportation at the lowest possible cost, then municipal ownership is not the way to attain it. As the Indianapolis *Star* said, the best way to insure good service at reasonable cost is to let the job to someone who knows the business.

Against the franchise proposal a number of objections were raised which in effect reflected on the intelligence and integrity of public officials since it was assumed they were not competent to enter into a contract that would protect the people's interest. There was nothing sinister about the company's proposal, but if the city felt unequal to the task of dealing adequately with the private interests, then how can it presume to deal intelligently with the many problems likely to arise under municipal ownership should it decide finally upon that course?

It would seem that in the objection to the Indianapolis proposal, a lot of straw men were set up merely that a delectable spectacle might be presented to the public in their demolition. That is particularly unfortunate since the alternative proposal of municipal ownership, even if it were accomplished, must bring in its wake trials and tribulations nowhere inherent in the franchise proposal of the private company, even if that were accepted in toto. It is certain that no one can be found who would provide the millions needed to rehabilitate the Indianapolis system unless reasonably assured of a return on the investment.

The offer made on behalf of the Indianapolis properties was backed by assurance by the Insulls that they would reconstruct the property and provide service adequate for the transportation requirements of the city. On no other basis than the expectation of a monopoly could a bid of the kind be made. And on no other basis is the city likely to secure adequate transportation service.

▼

Urban Transportation Receipts as a Barometer of Business

STATISTICS of current electric railway earnings today constitute a barometer of industrial conditions in American cities that compares well in accuracy with the various indexes put forth by other industries. It is even more valuable in some respects, since it is an average of all the industries represented in the communities served. This relation has been true ever since pleasure riding on street cars became almost a thing of the past, and their chief use narrowed down to transportation in connection with business.

Discussing this new indicator, Lucius S. Storrs, president of the United Railways & Electric Company of Baltimore, recently pointed out that there is a close similarity of trends in urban transportation of passengers and industrial activities, as analyzed by the company's research department. The two fluctuate in almost identical amount. However, he showed that there is a lag of about a month between changes in the payroll and changes in riding, since families use up the savings accumulated before adjusting themselves to the deprivations of unemployment. When employment conditions improve it takes about a month to clear up outstanding bills and resume normal spending habits.

If the receipts may be taken so faithfully as a barometer, it gives the manager of a railway property an excellent means of determining in advance the probable earnings if he has at hand the index of industrial employment. Programs of expenditure can be adjusted more closely to anticipated conditions, schedules can be planned in advance, and much slack taken out of the ordinary operations. With so much at stake, a careful compilation of trends in employment as an indicator of future street railway business is worth a great deal of attention, particularly at the present time.

▼

Seeing the Trolley Bus in Proper Perspective

REMARKABLE, indeed, has been the recent increase in popularity of the trolley bus. Three years ago it was looked upon as something of a curiosity, but scarcely to be considered as a practical solution to any large part of the transportation problem. Today it is in the minds of transportation men everywhere as a possible means of furnishing a type of service that is needed in many communities. Improvement in design is primarily responsible for this change. The trolley bus of today has vastly greater possibilities than that of three years ago. From 29 vehicles in service at the end of 1927 there has been an increase to 167 at the beginning of this year. Seldom has there been so great a change in so short a time. But the very magnitude of the change also constitutes a possible danger.

Conditions under which trolley buses are new being successfully operated vary widely. On Central Avenue, Chicago, the traffic carried is extremely heavy and headways are close—in the rush hour as close as 1¼ minutes. On Plymouth Road, Detroit, the traffic is very light and headways are much greater. The trolley buses in Salt Lake City operate in territory more densely populated than the Detroit route but not so heavily as that in Chicago. New Orleans, Knoxville, Brooklyn and Rockford, where installations have recently been made, furnish examples of other conditions, as do also the older trolley bus systems in Baltimore, Rochester, Philadelphia and Cohoes. From this, it is evident that the trolley bus is being operated under a very wide variety of conditions.

In this range of service for which the trolley bus is being used there is a possibility that it may be considered suitable for all transportation conditions. Opinion of those most experienced in trolley bus operation is emphatically against any such idea. It should be remembered that in past years many worth-while improvements have suffered from being used in many places where they were unsuited. The Birney car is an instance of this. While it unquestionably had a field, enthusiastic operators were not content to stop at adopting it for that field, but tried to use it for service far beyond its capabilities.

The trolley bus has its place. So also has the street car and the gasoline bus. When the latter first entered the transportation field, the electric railways were slow to adopt it. In some instances they have paid heavily for their tardiness. Naturally, they wish to avoid the repetition of such an experience. They may be tempted, therefore, to expand trolley bus operation beyond their proper field. To do that would hurt both themselves and a fine transportation vehicle. Undoubtedly, the trolley bus has a great future, but it will achieve its maximum usefulness only if used under conditions to which it is suited.

Another Victory for the Idea of Co-ordination

FOUR years after the report by the Board of Transportation of New York in which it presumed to see relief for New York in the granting of a city-wide franchise to an independent bus operator, that body has reversed itself in a recent report. The notion of independent operation never was sound, but at that time the board could not be dissuaded from submitting a recommendation which met with general disapproval. Drawing the only correct conclusion from the facts as they exist, the board now favors the award of bus franchises to the existing surface railways as nearly as possible on a borough-wide basis. Of course there never was any sound reason for divorcing bus and street car operation. One supplements the other and the convenience of the public demands their co-ordination.

The change of heart by the board has found quick favor with the press. Similarly when it comes to the possible substitution of bus service for trolley lines the attitude of the board is sound. This position also is approved by the press, notably the *Tribune*. Several of the surface railways have already indicated their desire to substitute buses for cars as a more elastic means of transportation on certain routes. Unless they are permitted to effect the desired changes by the grant of bus franchises in the territory they serve, the matter is destined to become the subject of prolonged and expensive litigation, and be indefinitely delayed.

These latest recommendations of the Board of Transportation are now in the hands of the Board of Estimate. In his first campaign for the mayoralty, Mr. Walker promised that within six months of taking office he would have the problem solved and a satisfactory system in operation. That was four years ago. Here's hoping that the action on the matter won't be postponed another four years. Whether or not one agrees with the advisability of all the changes proposed, there can be no question that a general settlement is imperative.

British Propaganda for Buses Over-Shoots the Mark

EARLY in January a British official body bearing the imposing title of "Royal Commission on Transport" delivered itself of a report which is a far cry from the judicial viewpoint characterizing the reports of previous commissions on transport. This latest body, appointed to review every aspect of the transportation situation in Great Britain, declared among other things that the street railway is definitely obsolescent if not actually obsolete. It said in effect: Build no more tramways; write the existing tramways off the books as quickly as possible; they are an obstruction and a hazard to all other users of the highway; they should be replaced by trolley buses or motor buses.

Before taking these recommendations too seriously, however, it is well to consider the personnel of the commission. In a special cable to the JOURNAL, presented in full elsewhere in this issue, the editor of the *Tramway and Railway World* of London points out that the members of the Royal Commission, with one or two exceptions, have had no practical acquaintance with transportation matters. "They are motorists," he says, "who as a class object to the presence of rails in the streets and ignore the fact that modernized tramways continue to be the most efficient and economical means of transport where large numbers of passengers have to be carried."

Recent expenditures of huge sums for modernization of tramway equipment in Great Britain indicate unmistakably that those best able to judge believe that street railways are an essential feature of urban transportation and will remain so for a long time to come. The London County Council, for example, has lately modernized some 1,400 of its 1,750 tram cars. More powerful motors, new upholstery and better lighting have been installed. The average speed has been raised to 10 m.p.h., including stops. As this is somewhat higher than the average speed of buses in London, the argument concerning the obstruction created by tram cars seems singularly weak. During the past month some of the 100 new tram cars being constructed for the Metropolitan Electric Tramways and the London United Tramways have been put in service. These companies are part of the well-known Underground group, with which the London General Omnibus Company is also affiliated. Surely the management of this great organization is in the most favorable possible position to judge the relative advantages of tram cars and buses.

The best-informed opinion in England is that no legislative action of any kind is likely to result from the tramway recommendations of the Royal Commission. The report appears to be merely one of those funeral orations with which the electric railway industry in this country is not unfamiliar. It may be said, as Mark Twain once remarked concerning the rumor of his own death, "the report is greatly exaggerated."

Street Railway Publicity

THEN *and* NOW

By

Raymond S. Tompkins

Executive Assistant
United Railways & Electric Company
Baltimore, Md.

DURING the past twenty years the street railway industry has probably advanced farther than any other in an understanding of the principles and practice of the noble art of publicity. Perhaps it had more to learn than any of them. A famous Baltimore lawyer once said in open court of one of his colleagues at the bar who happened to be on the other side of a case, "Your Honor, Hercules, with his Archimedean lever, couldn't raise my esteemed brother to the level of a complete ignoramus," and that seemed almost true at one time of the street railway industry's conception of the fundamentals of public relations.

Today, the old-time traction man would be amazed at the freedom of his enlightened grandson with the press. He would shudder at the statements given out about a company's finances. Modern interviews dealing with projected improvements or retrenchments, wages, tax and paving problems would give him the creeps. The dreadful spectacle of a street railway executive deliberately walking into a meeting of a community improvement association or a Chamber of Commerce to meet opponents face to face and lay his cards on the table would send the old fellow to bed with an awful headache. The old traction men were worse than ignorant about publicity; that is to say, they preferred to be ignorant. The sort of publicity they were familiar with made them pretty doleful most of the time, and their general feeling about it was that the less they had of it the better. Reporters, editors, city and state officials and politicians already cooked up enough dirt and scandal about the business; it looked like deliberate suicide to adopt any plan calculated to let these rascals deeper into its mysteries, something like a research biologist deliberately shooting himself in the arm with pox germs to find out how to cure the pox. That was all right for scientific experiments, but you couldn't expect any such wanton self-sacrifice from business men with the property and money of investors at stake.

Newspapers Were Generally Hostile

It is easy to understand the reason for this. Even the briefest study of old files and scrapbooks reveals such a definitely and consistently hostile attitude toward street car companies in the nineties and early nineteen hundreds, that our forefathers in the business must have been punch-drunk most of the time. If today's operating man feels aggrieved at the way the newspapers in his town handle a story about his company, he should read what the papers of 20 or 30 years ago used to say about his industrial ancestors. The stuff those hardy pioneers had to swallow about themselves every day would have given lesser men incurable jim-jams. The traction news in the papers dealt almost exclusively with the alleged stupidity, greed, indifference to human suffering, and criminal negligence of the "traction barons."

An innocent merger between two or more competing companies was usually hailed by the press as a "gigantic scheme," with few probable benefits beyond the guaranteeing of "liberal dividends" to the stockholders of the weaker companies. A runaway cable car was good for a thrilling column featuring the sickening speed, trees and houses flying by, tightly corseted ladies fainting all over the car floor. Strong reputations for fiendish cruelty were built up for the horse-car men by reporters who went out and counted the ribs of tired horses, and the sores on their backs, and interviewed passengers who had to get out and help a horse by pushing a car up a hill. These stories usually began, "Has the S.P.C.A. gone out of business, or is it because cruelty to animals is practiced by a rich corporation like the Traction Company that the Society doesn't interfere?" Magistrates who let the drivers off when the S.P.C.A. brought the cases to court really were believed to be in the pay of the companies.

Speed and Accidents Were News Features

As horse cars disappeared and transit grew more rapid, cable and electric cars ran over a good many people. In the most natural manner in the world the public quickly assumed that the traction tyrants viewed these episodes with great relish. Standing heads like "Rapid Transit Mishaps" were kept set up in the composing rooms, to be replaced on occasion with especially tasty headlines like "A Life for a Penny," when a little girl was killed while crossing a street because she stopped on the tracks to pick up a cent. All over the country there were fierce squabbles about fenders, and any company that delayed adopting fenders or "cow-catchers" until they could find an efficient one was roundly denounced for preferring profits to protecting human life. When overhead electric lines went up, the appearance of gangs to plant the poles in the sidewalks was the signal for violent outbursts, appeals to the police,

Thirty Years Ago—

Newspaper reporters were refused admittance to the office of the street railway manager

Today— **The representative of the railway goes direct to the newspaper office with all the facts.**

injunctions and street fights. An Episcopal Bishop, whose horse and surrey had narrowly escaped a collision with an electric car of 1902, wrote a letter of protest to the Mayor, describing the speed of the car as "absolutely furious and beyond anything I have ever seen before."

That bewilderment in the face of such attacks should have been succeeded by a certain doggedness, easily mistaken for deliberately brutal indifference, was perhaps a natural step in the development of the cience of publicity in the street railway ndustry. They couldn't understand it, and hey didn't know what to do about it. A simple remedy seemed to be to slip annual ree passes to editors, but a good many editors got a lot of righteous pleasure out of eturning the passes with indignant letters announcing that they refused to be "bought," and this noble gesture was always good for a half-column editorial. Obviously, people wanted rapid ransit; clearly, electricity was furnishing it, and just as clearly this involved wires, poles on the sidewalks, speed and danger, but it was all in the direction of progress and improvement. But since progress and improvement in the transportation business seemed inevitably to involve greater public abuse, the street railway men seem to have come to the conclusion that the best policy was stubborn silence about everything they did, because what looked sound to a traction man always looked rotten to everybody else. It was easy for the newspapers and the public to translate this silence into inister secrecy. Thus public relations grew correspondingly worse.

To take up "publicity" as an art, as important, at least, as the art of conducting a department of maintenance of way, or a financial department, or an operations department —this was entirely too far-fetched for the battle-scarred traction veteran. Too often "publicity" looked like some sort of skullduggery—justifiable skullduggery, probably, but too dangerous to fool with, in the light of explosions that had followed skullduggeries discovered in the past. The old-timer had been accused of this sort of thing too often to go around hunting for trouble. Indeed, the ancients in the street railway business easily became the most honest public utility people in the world, as skittish as colts about making a wrong move, and just about as articulate. Men who chattered about publicity sounded too glib to them. The science had a suspicious smell about it, and since it involved taking the roaring lions of contemporary journalism and turning them into cooing doves, it must be crooked. From the very nature of their business they were matter-of-fact men and full of curdling doubts about what they could not understand—what could not be reduced to rule and rote. Solve the problem of publicity by frankness? Why, this was like trying to lick a bully by sticking out your jaw for him to hit; and the explanation that the frankness had to be expressed "intelligently," was no good. You could stick out your jaw intelligently and be just as long coming to in the hospital as if you had been stupid about it.

The industry's muddled state of mind about this problem, even as recently as 1912, was illustrated at the 31st annual convention of the American Electric Railway Association in Chicago. By this time the need of doing something had become so acute that the association had recklessly gone on record as being "heartily in favor of publicity," and as "seeking to obtain the confidence of the public." This courageous gesture was somewhat counteracted by the fact that prying any news out of the annual conventions was like trying to pry eggs out of an incubator chicken. The newspapers had access to the official programs which were full of inspiring speech titles and committee subjects, all of them provocative to a reporter with any news sense, but apparently a reporter who wanted a copy of any of these speeches had to steal it. At the 1912 convention there was an official publicity man, but nobody seems to have seen fit to furnish any copies of these speeches or committee reports even to him.

The plaints of this luckless publicity man, Arthur Warren, of New York, sound today pathetic and incredible. He made a speech entitled, "A Policy of Publicity." Said he:

> During the present week we have had continually to disappoint the representatives of the newspapers of this city and other cities and all news distributing agencies because it has been impossible to supply them with the material which they have legitimately expected to receive. At a "Policy of Publicity" carried into effect in this manner they naturally wonder . . . Am I to tell them that some of these documents—some of these reports and addresses—are not to be made public? In that case, they will inquire, "What kind of policy of publicity is this, and of what are you afraid?" If you wish to sit in executive session, that is another matter, and your right to engage in it that way will not be disputed. But, then, why announce those themes and discussions publicly to anyone who takes the trouble to read your printed program?

Younger men, familiar with the highly efficient machinery for frank and thorough publicity which is set up and operated by Labert St. Clair at modern street railway conventions, will find the picture presented by the distraught and perspiring Mr. Warren hard to understand. Yet it happened only eighteen years ago.

Sound and Proper Publicity Has Been Developed

But these were the humble beginnings of the street railway industry's present highly developed sense of sound and proper publicity; and the drudgery required of the modern publicity worker to collect and turn out his material and follow it as far into the printed headlines as he can was no heavier than the toil of the pioneers to get the fundamental principles accepted by the industry it was destined to benefit. The job is by no means over and probably never will be. Man's very nature makes him suspicious of the word "publicity," and while publicity work is as commonly accepted today as the practice of medicine, and publicity output is more tremendous in volume than the output of almost any other profession or business, it is still the fashion in some quarters to leer and smirk at it.

The fault lies in the nature of news, which is what good publicity must be. News is gossip, authentic gossip, to be sure, but gossip nevertheless. Its essence is the stuff people talk about in the streets. While gossiping is the chief pastime of all Americans—not even excepting bridge, golf, or home-brewing—the term smacks of stealth, hole-and-corner stuff. Hence any man with a reputation for spreading gossip is looked upon by his moral fellows with a slightly jaundiced eye. So an unsanctified odor still seems to cling a little to the robes of the publicity man, whether he works for a public utility, the meat-packing business or a high-powered lady evangelist.

Therefore, the art is best practiced and its results are most satisfying in the long run when the work is done with the utmost openness and frankness. If there is anything about publicity that the street railway industry has yet to learn more thoroughly, it is this. Newspaper men have been played upon so long with "dodges" and stunts that most of them can spot this sort of fakery a mile off, and they take great delight in setting their feet upon its neck. The fear of the old-time traction man against taking up a firm, honest, and open stand for something he believed in because of the blows that might descend upon his already battered head survives today not only among a few transportation people but in every line of business and industry. This has produced, and still produces, though not in enlightened circles, the habit of getting somebody else to take the stand—some public official or some community group or some neutral uplifter anxious for the limelight. It works for a while, but one inevitable result is the collapse of that particular cause. Another certain result is the suspicion that the people behind the utterance or the campaign are actually the people who really are behind it, and they, eventually and inevitably stripped of their false whiskers, are held up to public ridicule and abuse and driven into exile, not on account of the cause they tried to promote, but because they tried to promote it secretly and were found out. The country is familiar with recent examples of this tragedy.

The Public Is Gaining the Railways' Viewpoint

The street railway industry as a whole has not been guilty of any such mistakes. It has learned its publicity lessons more slowly than most other businesses, but, in the main, it has learned sound stuff. Where any of its practitioners may fear to take open stands on traffic, taxation, fares, or any other problems, they know, at least, that there is no reward for taking the stand behind the back of some supposedly neutral and disinterested party, or they should know it. The American city today knows that its street railway men are honest business men doing work at least as necessary as the work of the letter carrier, and knows they have problems and more than half suspects what these problems are, and that there may be some soundness in the traction viewpoint. Today they can take street railway publicity without gagging, or yelling for the village beadle.

Not without considerable credit for this epochal industrial reform are the practicing publicity men themselves, who, now that they have sold their lords and masters on the power of their art, have, in a sense, turned around and kicked the props from under them. They have accomplished this by insisting that, after all, no amount of publicity is worth anything if you don't first supply the public, whose ear you seek, with a substantial amount of satisfactory service. The operators, shocked at first, have become broadly genial and tolerant toward the antics of their publicity vassals, and are willing to grant that, perhaps after all, they may be right even in this. Anyway, it cannot be proved that they are wrong. And so street railway service improves, people cheer (in a manner of speaking), and newspaper editors can behold a street railway publicity man entering the city room without summoning the bouncer to throw him out. All this would be a great surprise to the old-timer in the business.

Field Work in Car Research to Be Done at Brooklyn

Preliminary studies have been begun by chief engineer of the Presidents' Conference Committee. Performance data to be collected for many types of present equipment to determine possibilities of design improvement

With the selection of Brooklyn as the field laboratory the active research work of the Electric Railway Presidents' Conference Committee has now gotten under way. During the time which has elapsed since the A.E.R.A. convention at San Francisco, when announcement was made of the committee's plans and the appointment of C. F. Hirshfeld as its chief engineer, a large amount of preliminary work has been done in organizing the research program. The committee is now ready to proceed with the collection of the data needed for analytical purposes.

The primary function of the field laboratory is to provide facilities for the collection of the information needed to determine the possibilities of design improvement. While numerous studies have been made in the past concerning certain phases of equipment performance, details of other phases are almost entirely lacking. It is expected that the studies now being undertaken will produce a large amount of information concerning the limitations of present equipment performance and the possibilities of new developments.

A second purpose of the laboratory will be to permit comparisons to be made under similar conditions of the characteristics of cars recently built by individual companies. Thus the committee will take advantage of the progress which has already been made in developing cars to meet present-day operating and traffic conditions. Since the research work will be done with the full co-operation of the manufacturers, it is expected to encourage further developments by them and to reduce to a minimum the cost of securing recognition for whatever new products they develop.

A further advantage to the industry will result from assembling at one place numerous examples of the most modern units of equipment. Engineers and executives of operating companies considering the acquisition of new equipment will be able to inspect the units assembled at Brooklyn and study the details of their performance. In this way they will be able better to determine the types of equipment to meet their own particular needs.

Brooklyn was selected as the site of the field laboratory because of the existence there of many facilities needed for carrying on the work. The surface lines system of the Brooklyn & Queens Transit Corporation has standard gage track, both paved and unpaved so situated that research can be conducted without interfering with regular operation. At the same time, it has routes operating under a wide variety of traffic conditions where service tests can be made if desired. Adequate shop and storage facilities are available for the equipment undergoing test. Access is convenient to a number of important laboratories and research authorities whose co-operation and assistance is expected. Several well-known firms of instrument makers are available nearby to furnish such apparatus as may be needed. Excellent physical facilities exist for use as research headquarters, and the management and technical personnel of the railway feel enthusiastic interest in the work being undertaken by the committee.

It is understood that operating conditions on some other properties are very different from those in Brooklyn. The conclusions reached in the preliminary field work therefore will be checked further by operations under a wide variety of conditions on other properties. It is expected, however, that the facilities available in Brooklyn will enable the committee's engineers to measure effectively many factors of car performance concerning which there has been wide difference of opinion in the past. This, it is believed, is a necessary first step in bringing about the development of new equipment to meet the industry's operating and economic problems.

Quebec Railway Active in Taxi Operation

Another electric railway which has recently entered the taxicab business, but which was not included in the summary given in the January issue of the Journal because exact information was not available at that time, is the Quebec Railway Light & Power Company. Explaining the reasons for entry into the field, J. E. Tanguay, general manager, says:

> It is our opinion that, in a number of cities, taxicab operations are a source of strong competition to electric railways just as is motor competition not only to electric lines but also to steam railroads. In a number of instances, electric railway and large railroad companies have decided, after careful study, to operate motor coach service as a protective measure. Similarly, they are coming to realize the importance of establishing taxicab service.
>
> In the city of Quebec, in addition to the individual taxicab owners, there are three taxicab companies all competing against one another and, naturally, all are competitors of the electric railway. After serious thought and study of the many angles of the problem, it was decided to purchase the oldest of these companies, reorganize it, taking out of service all antiquated and obsolete equipment, and installing modern up-to-date equipment, employing none but careful and courteous chauffeurs. All this was done with the object of giving most efficient and reliable service in all respects.
>
> With the advertising facilities at the disposal of a large public utility company, we feel that we can impress upon the general public the importance of using a taxicab service owned and operated by an experienced organization which fully realizes its responsibilities.
>
> We have been operating this taxi service since last Spring only, and now control the exclusive privilege of taxicab requirements of nearly all the hotels, clubs, etc., in Quebec.
>
> Another reason which impelled us to enter the taxicab business was the number of demands made by our tourist agencies throughout the United States for private motor car services to be rendered to their clients while visiting the city of Quebec. Operating our own service, as we now do, we are certain that these visitors will be supplied with modern and comfortable equipment and, also, with careful, courteous and experienced chauffeurs. Otherwise, we would be obliged to hand this business over to other taxi owners who are our competitors.

Reading Electrification Progresses

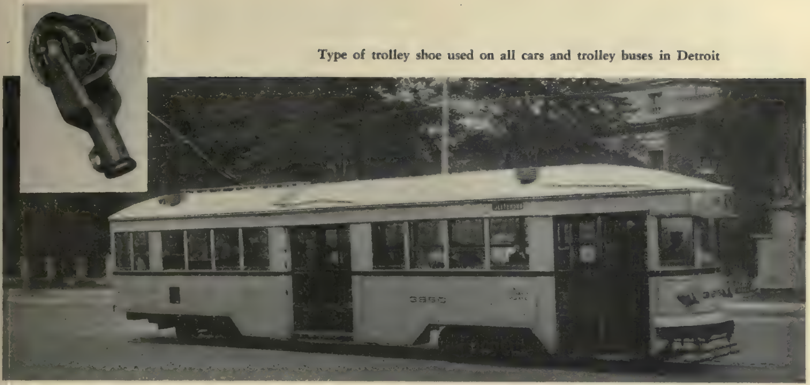
Installing one of the 8,000-kva. transformers in the outdoor substation at Wayne Junction

Erection of the 15,000-kw. outdoor frequency-changer sets is under way

POWER for the electrification of the Reading Company's suburban railway lines in Philadelphia and vicinity will be obtained from the Philadelphia Electric Company's 60-cycle high-tension network. In order to convert it to 25 cycles for supplying the trains with single-phase current, an outdoor substation is being built at Wayne Junction. The illustrations show the progress of the work. A discussion of the power supply appeared in ELECTRIC RAILWAY JOURNAL for December, 1930, page 747.

This general view shows the appearance of the main frequency changer station which will supply the Reading

Type of trolley shoe used on all cars and trolley buses in Detroit



TROLLEY SHOES

Prove Advantageous in Detroit

Since their adoption on all cars and trolley buses of the system, overhead maintenance costs have been lowered substantially. Fewer wire breaks and replacements, less noise and reduction of service interruptions among benefits obtained

WITH more than two years of experience in the use of trolley shoes and a polishing compound for the trolley wire, the Department of Street Railways, of Detroit, Mich., is entirely satisfied with the complete change-over to this type of operation. Early n 1929, the conversion process was begun, continuing until the middle of 1930, when the last line of the system was changed over to trolley shoe operation. In making his change, the Detroit system became the largest user of trolley shoes and the only large city using them exclusively. Trolley shoes have been used on interurban electric railways for many years and a number have adopted these as standard, but no city property used hem for any appreciable period of time until the Detroit nstallation was made.

Since the shoes were adopted some notable records have been made in Detroit. For example, the entire system, with more than 1,800 cars, was operated for a period of 82 days with only one trolley wire break. Another record was made on East Jefferson Avenue, the high-speed express line, during the year from July 15, 1929, to July 15, 1930, when the cars on this route traveled a total of 2,216,176 miles with no wire breaks. This total represented 146,888 car movements. Micrometer measurements of the trolley wire on this line showed a reduction in diameter of only 0.0015 in. for the twelve months. This same line operated for a full fourteen months before a break occurred.

The actual record for trolley wire breaks during the period from 1922 to the present, is as follows:

1922	1,416	1927	340
1923	1,000	1928	140
1924	580	1929	120
1925	700	1930	100
1926	725		

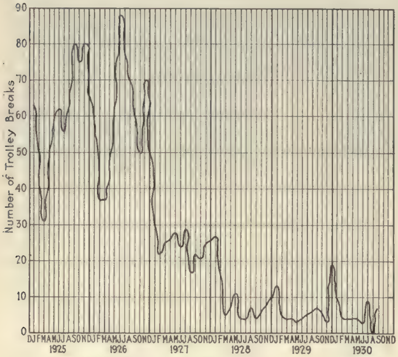
The record from January, 1925, to September, 1930, is shown in an accompanying chart. The sharp decline of the curve represents a decrease in breaks from about 90 to 4 per month. It has been estimated that the life of trolley wire with shoes is three times as great as that with trolley wheels. Mileage of wires replaced in the period from 1926 to the present has been lowered to about one-third of the first figure. The actual record is:

1926	105 miles	1929	53 miles
1927	62 miles	1930	35 miles
1928	118 miles		

It is expected that the annual mileage of wires replaced will continue to decrease, as the older wire on the system, used also with trolley wheels, is gradually replaced.

Development of the Trolley Shoe

When the trolley shoe was first introduced, many years ago, two serious obstacles were encountered—the high rate of wear on both the shoes and the trolley wire, and the difficulty in keeping the shoes on the overhead when reversing. The development of the reversible trolley shoe, as used on the Detroit system, and improved designs of other types of shoes has practically eliminated the latter trouble. To overcome the first objection, that of excessive wear, experiments were made with lubricating the wire with oil or grease. This practice reduced the friction, as well as the noise, but had two accompanying disadvantages. These were the insulating effect of the lubricant and the difficulty in keeping the oil or grease from dropping on the car roofs and streets. The necessity for lubricating the wire at very frequent intervals also was a drawback.



Trolley wire breaks have been reduced from approximately 90 to 4 per month in the period from January, 1925, to September, 1930

Experimentation with compounds, composed principally of graphite, overcame most of these objections. At present, the Detroit municipal system, the Eastern Michigan Railways and some others are using a graphitic compound for polishing the trolley wire, with satisfactory results. This compound adheres firmly to the wire, produces a bright polish, reduces friction to a minimum, eliminates the dropping of messy material on the cars and streets, reduces noise and serves as a suitable conductor.

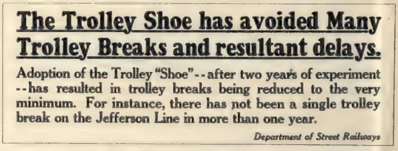
Another problem in the early stage of development was the actual application of the compound to the trolley wire. A number of devices were constructed, some of them fairly satisfactory, but most of them with certain serious drawbacks. A pressure method, however, using a spray nozzle attached to the trolley harp of a line car and connected by a flexible hose with a reservoir tank at one end of the car body, proved to be effective. At the present time, an improved device is being constructed in Detroit, which will be still more effective.

Advantages of a Sliding Collector

The theory of using a sliding contactor for current collection has long had many supporters. With a trolley wheel only a minute portion of the perpihery is available for contact with the wire. When a car is operating at high speed, the contact with trolley wheels is subject to interruption when rough spots in the wire or special work are encountered. The arcing which results usually burns a small hole in the wire. In actual tests with a voltmeter, it has been found almost impossible to obtain satisfactory readings because of the great fluctuation of the voltage, while with shoes, constant readings could be obtained. There are three appreciable advantages from this steady supply of current at constant voltage—more satisfactory operation and maintenance of all electrical equipment, steadier lights and less radio interference, caused by frequent arcing with the movement of cars. Elimination of arcing, hammering and crystallization at special work has prolonged the life of trolley wire and reduced the number of wire breaks. Two other factors that contribute to longer life are the reduction of vibration and the use of less pressure of the trolley poles on the wire, possible with the use of trolley shoes. In Detroit, the pressure has been reduced from 30 to 20 lb. Incidentally, dewirements and bent poles have been practically absent with the use of shoes.

Actual tests of trolley shoes in other cities have shown radio interference to be practically eliminated on lines where numerous complaints had been received before. Although no records have been kept of the effect on electrical equipment, it has been observed in Detroit that less motor trouble has developed since the installation of shoes. An incidental operating advantage is that the compound used on the wire tends to reduce the adhesion of sleet in winter and allows its easy removal with a sleet cutter.

From the standpoint of the public, the two principal advantages are the reduction of service interruptions and the decrease in noise from overhead contact. The singing and vibration, which sometimes accompany the use of trolley wheels when cars are operated at high speed, are eliminated with the use of shoes. When the trolley wire is polished properly, the noise of contact is barely audible. This reduction of noise is particularly noticeable in the trolley buses of the system.



The Trolley Shoe has avoided Many Trolley Breaks and resultant delays.

Adoption of the Trolley "Shoe"--after two years of experiment --has resulted in trolley breaks being reduced to the very minimum. For instance, there has not been a single trolley break on the Jefferson Line in more than one year.

Department of Street Railways

The record with trolley shoes on East Jefferson was called to the attention of the public by posters, displayed inside the cars

As stated previously, the first conversion of a line on the Detroit system was made early in 1929. Throughout that year and during most of 1930 numerous tests were made. These proved the merit of the method and the shoe was adopted for use throughout the system. The type of shoe used exclusively in Detroit is the so-called

"Ionloyd Reversible Trolley Shoe," manufactured by the Efficiency Products Corporation, of Detroit. It is so designed that when one groove has worn sufficiently a similar contacting area can be presented by reversing the shoe in the harp.

The compound used for polishing the overhead is known as "Lubrion," and is also manufactured by the Efficiency Products Corporation. It is a compound of graphite, red lead, glycerine and other materials. The compound dries very quickly on the wire and leaves a thin coating which becomes more highly polished every time a contactor passes.

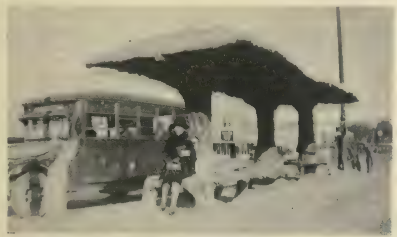
Under usual weather conditions, the compound is applied to the wire once a month. However, when subjected to severe rains, the compound is used more frequently. The apparatus used by the Eastern Michigan Railways for applying the compound was described in the May, 1930, issue of the JOURNAL. It consists of a spray nozzle attached to the trolley harp of a line car and connected by a flexible hose with a reservoir tank. A pressure of 20 lb. per sq.in. is maintained in the reservoir by tapping the regular air supply of the car. Under the trolley harp a receptacle is provided to catch any excessive lubricant. The material used is mixed with water in the amount of 1 lb. to 1 gal. After being sprayed on the wire, the water evaporates, leaving a dry deposit. This company uses a supply car and so plans its distribution of materials that the regular trips are made at the time the wire needs polishing. The Department of Street Railway uses a similar device, but uses a paste to force the compound to the wire. A special car is used for the purpose, and all polishing is done at night.

The cost of the compound and applying it is small compared to the savings resulting from the longer life of wire and collectors, and the fewer number of wire breaks.

At present, a new device is being developed which will have a tank mounted on the car, with a capacity sufficient to cover the entire system. This will be about 3 gal. A standard shoe, with a $\frac{1}{8}$-in. hole bored in the groove, will be used for applying the compound to the wire. An improved system of forcing the paste to the wire, including an indicator for detecting whether the flow is at the proper rate, will be incorporated in the new design.

◆

Attractive Bus Waiting Station at San Antonio



An unusual concrete waiting station, designed to resemble three trees with interlocking leaves and branches, has recently been built by the San Antonio Public Service Company. The waiting station is in the center of a wide street. The bus stops on one side going out, and on the other side returning from its trip around the Alamo Heights loop.

Patronage Encouraged by Correspondence

REPLIES received by the Georgia Power Company in response to a series of letters sent to some 2,000 representative citizens of Atlanta indicate a widespread interest in and a wholesome appreciation of the street railway service. The mailing list was made up of names selected from the membership lists of the local chamber of commerce and the Atlanta Motor Club, and embraced people from all walks of life. The letter described briefly the advantages of riding the street car, particularly as contrasted with the difficulties attending the operation and parking of automobiles in the downtown area. Each letter contained two street car tickets, with the invitation that the recipient try the service and see how he liked it.

A total of 188 letters were received, which is considered a high return in view of the fact that no replies were solicited. Of this number, only two could be classified as unfavorable, although certain others contained suggestions for the improvement of the service. A surprisingly large number of the replies indicated that the writers used the street cars more or less frequently, in spite of the fact that they also owned and drove their own cars. Among the writers who said they habitually used automobiles, sixteen stated that they would use the car tickets sent them at the first opportunity, and several made the comment that they believed they would be more frequent riders in the future.

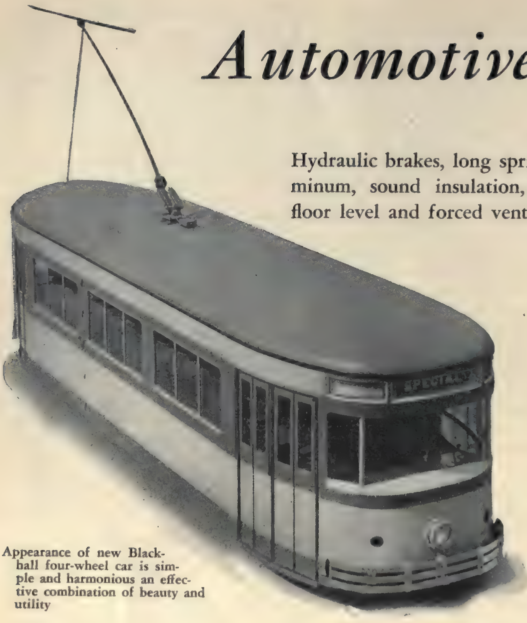
Those from whom letters were received included the chairman of the board of a large bank, who stated that he was a frequent patron; a railroad president, who said he rode the street cars every day; a bank president, who agreed to try a "sample" ride; and a number of vice-presidents of banks, who termed themselves regular patrons of the street cars. A prominent minister of one of the city's largest congregations said he used the cars frequently to conserve energy, and the president of a college praised the service highly, stating that almost the entire student body depended upon street car service for transportation.

Letters containing suggestions for improvement totaled eighteen. Several suggested means by which the cars could be speeded up; others suggested changes in routes, increased service on certain lines, improvement is destination signs, and the further training of conductors and motormen in courtesy in dealing with passengers. Evidence of real thinking among the writers was given by a suggestion that the company adopt the weekly pass, and another that additional emphasis be given in the company's advertising to the economy of street car riding.

While the company has no definite means of determining whether the circulation of these letters and the accompanying distribution of free tickets has affected its traffic or revenues to any extent, its officials feel that the effort was very well worth while. Through the replies received, they have acquired a cross-section of local public opinion that would have been difficult to get by any other means. An opportunity has been afforded of smoothing out a number of differences of opinion, and many prominent business men have been reminded, in a clear cut, forcible manner, that there is good street railway service in Atlanta, and that the railway officials are alive to their responsibilities.

Automotive Principles

Hydraulic brakes, long spring base, extensive use of aluminum, sound insulation, continuous body lines, low floor level and forced ventilation are distinctive features



Appearance of new Blackhall four-wheel car is simple and harmonious an effective combination of beauty and utility

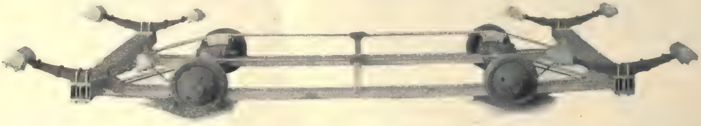
DESIGNED to compete with the private automobile in comfort, appearance and speed, the new four-wheel car, developed by J. R. Blackhall, has many features which are entirely new, and some which have been adopted from other industries in a deliberate attempt to depart from the conventional street car. Every effort was made to provide transportation which people will prefer to driving their own automobiles. Incidentally, some notable operating economies have been effected.

The project was initiated and supervised by Mr. Blackhall, general manager Chicago, North Shore & Milwaukee Railroad, and vice-president Chicago & Joliet Electric Railway, and was carried out under the direction of Harvey S. Pardee, consulting engineer. The car was built at the plant of the Cummings Car & Coach Company and equipped and tested on the property of the Chicago & Joliet Electric Railway. It has been under experimental adjustment and in regular service on this property since the early part of 1930.

It is designed for one-man, single-end operation on lines of medium traffic density. With certain modifications many of its features can be applied to the trolley bus or to the large double-truck car for heavy traffic. Principal specifications are: length over bumpers, 36 ft.; axle centers, 11 ft.; width over side posts, 8 ft. 6 in.; height, floor to top of roof, 9 ft. 8 in.; width of front door opening, 52 in.; floor height above rail, 24 in.; seating capacity, 40; and total weight, 17,500 lb.

The chassis, as shown in one of the accompanying illustrations, is made up of two Timken semi-floating axles with a centrally located worm gear, having a ratio of 5.8 to 1. The housing is heat-treated cast aluminum alloy and carries lubricant for the gearing and the roller bearings in the ends of the housings. The two side frames are trusses, with the compression members underslung from the axles and the truss rods running over axle bearing on saddles insulated from the axles by rubber pads. The axles are spaced on 11-ft. centers, the side frames extending 42 in. beyond. Fastened to the ends of the side frames are cross members which carry the springs on 18-ft. centers. Spring ends are inclosed in Masury shock insulators in aluminum boxes. The weight of the chassis without springs is 2,900 lb.

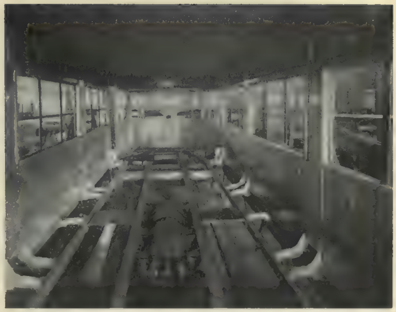
Particular attention has been paid to minimizing pitching, nosing and rolling. The car running on a poor track cannot claim better riding qualities than a heavy double-truck car with long truck centers, but on fair or good



The truck consists of two semi-floating axles, with 22-in. wheels, two side frames designed as trusses and cross members at the frame ends for supporting the springs

Applied in Design of

New Blackhall Car



Inside of car, showing the underframe and body construction, and the method of mounting the motors

track is said to be better than most double-truck cars. Nosing and rolling are practically absent, and pitching is limited to one movement for each track depression, the body motion leveling off immediately without bobbing.

The underframe, also illustrated, is made entirely of heat-treated strong alloy aluminum extruded or rolled Carnegie sections and castings. The metal shapes were bent before heat-treating and as installed have a yield point of approximately 35,000 lb. per sq.in. and ultimate strength of 60,000 lb. per sq.in. The strongest members are the two center sills which extend the full length, providing a strong resistance to collision. The two motors, supported by the center sills, are secured to brackets with four bolts in Lord rubber bushings. Flood Brothers universal joints connect the motor shafts to the worm shafts of the axles.

The inside walls of the body are the girder or strength members, while the outside sheets are mere covers, easily removable and replaceable. The inside pier panels are continuous up to the roof plate, thus providing the equivalent of a box girder 12 in. wide. Posts are attached to the underframe by aluminum alloy brackets which have strength practically the same as cast steel. Window frames are of extruded aluminum sections, welded at the corners. The ceiling is of hard-rolled aluminum sheet, curved in semi-elliptical shape and carried around the vestibule.

Electrical equipment consists of two 50-hp., 600-volt

Important Features of Blackhall Car

1. Chassis, made up of two Timken semi-floating axles, with a centrally located worm gear on each, four 22-in. spun cast steel wheels, two side frames designed as trusses with compression members underslung from the axles, and cross members at the frame end which carry the springs on 18-ft. centers.

2. Underframe, made entirely of heat-treated strong alloy aluminum extruded and rolled Carnegie sections and castings, designed to support two 50-hp. motors; body construction, with inside walls comprising the strength members, outside sheets removable with a screw driver, window frames of extruded aluminum sections, ceiling of part rolled aluminum sheet carried around the vestibule in the form of an ellipsoid, ends of replaceable aluminum castings, and insulated walls.

3. Dynamic braking and two alternative systems of friction braking, using brake shoes on disks mounted on motor shafts; also connections to allow "plugging the motors" for severe braking.

4. Hydraulic, instead of air, operation of brakes and doors, using a small gear pump mounted on the worm housing of the axle, and weighing only a few pounds.

5. Use of 6,876 lb. of aluminum in the chassis and body, saving 12,324 lb., and making possible the low total weight of 17,500 lb.

6. Noise reduction, effected by stopping wheel resonance, inserting rubber pads between the axles and chassis frame, installing rubber shock insulators on the spring ends, insulating the floor, trolley base and motor supports, and eliminating air exhaust.

7. Cadmium-plated bolts, nuts and screws with National fine (S.A.E.) threads.

8. Pleasing exterior, enhanced by elliptical profile of roof, the elimination of roof appurtenances except the trolley base, body lines carried around the entire car without break, continuous skirt brought down to the step-well level, plate glass side windows arranged in three groups of three each, chromium-plated bumpers, and Duco finish with Abbott gray as principal body color and Tonowanda green as the relief.

9. A 52-in. front door, two 12-in. steps, leading to the low floor level of 24 in., and a treadle-operated rear door.

10. Attractive interior, with semi-bucket type leather seats for 40, automotive crank mechanism for windows, and finish in softer tints of dominant colors used on the exterior; no bulkheads, partitions, cabinets, inaccessible corners, exposed piping mechanisms or woodwork.

11. Ventilation by a motor-driven volume exhaust blower, removing the air through grilles in the ceiling.

12. Heating by utilizing the rheostatic losses during the periods of acceleration or resistance and dynamic braking.

No. 1426 Westinghouse motors. Power is regulated by a master controller and contactors with eleven points of acceleration and eight in reverse for dynamic braking. The reverser handle is convenient to the operator and, at a special notch, will "plug" the motors without aid of the contactors. Three points on the controller and the dead-man brake control are brought to a small rear end control for reversing. A 12-volt, 37-amp.-hr. storage battery is provided for emergency use.

Service braking is dynamic, using the motors as generators, discharging into the rheostat. It is possible with these brakes to bring the car fully to a stop on level track and to 1 or 2 m.p.h. on a 9 per cent grade. The alternative system of braking used is obtained by mechanical friction of brake shoes clamping on a disk on the motor shaft. The shoes are brought together by an eccentric movement actuated by a push rod from the brake cylinder. Each cylinder has a displacement of about 1 cu.in. for full application. A metallic expansion bellows is used in place of a piston to move the rod about ⅜ in.

Two systems of friction brakes are provided. One pair of shoes on each motor disk is operated from the dead-man control, and is used principally in holding the car when the operator is engaged otherwise. The other brake shoes, one pair on each motor, are operated by a pedal and while they are sufficient for regular service braking, they are used chiefly in making the final smooth stop. Both the application and the release of these friction brakes are practically instantaneous. In addition to the dynamic and friction braking, the operator can get immediate braking by "plugging" the motors.

The brake and door movements are effected hydraulically instead of with compressed air. A small gear pump, shown in an illustration, is mounted on the worm housing of the axle and keyed into the end of the worm shaft. Metallic hose connects the pump to the sump and pressure tanks. The latter tank is filled partly with liquid and partly with air, which is under 110 lb. pressure for energy storage when the pump is not running. The liquid may be of any suitable viscosity and preferably non-inflammable. From the pressure tank the liquid is drawn through solenoid operated three-way valves to the operating mechanism on the doors and brakes. On reverse motion, the liquid flows to the sump tank. The brake valve is controlled by a switch in the dead-man handle, the front doors by switches in front of the operator, and the rear door by a treadle switch.

The pump weighs only a few pounds, has no valves and has only two moving parts, a shaft rotor and an idling gear. A mechanical type of seal on the shaft is connected to the suction side to prevent leakage. The pump uses about 0.2 hp. when the car is running at 10 m.p.h., and pumps 2,000 cu.in. every mile. Movement of about one car length is enough to permit operation of all the doors and brakes once. Excess pumpage is returned to the sump tank by a spring-loaded governor valve which maintains standard pressure in the pressure tank. Sufficient energy is stored to operate all the doors from 20 to 30 times without the pump. About 6 gal. of liquid is used. The system weighs, with all equipment, pump, liquid tanks, tubing, valves, door and brake cylinders, less than 150 lb. It is unaffected by humidity or temperature extremes, is simple to maintain, and is comparatively noiseless and certain in operation.

A total of 6,876 lb. of aluminum was used in the chassis and body. Had the car been made of steel of equal strength, it is estimated that the weight of the metal would have been 19,200 lb. The saving in weight, therefore, was 12,324 lb. This reduction was accomplished at a cost of approximately $2,295. The saving in energy consumption, determined by actual tests was 0.8 kw.-hr. per car-mile. Based on 150 miles per day for 350 days per year and a power cost of 1.5 cents per kw.-hr. at the car, the power saving is $630. This is 27.4 per cent of the extra investment in aluminum.

Under view, showing the hydraulic-brake system, the brake disk mounted on the propeller shaft, the brake shoes and the semi-floating axle

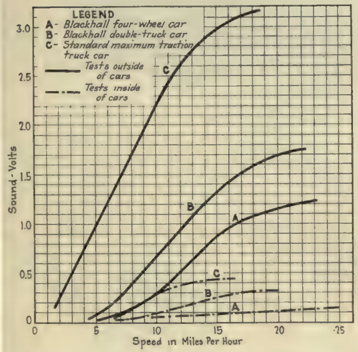
Sound insulation and noise prevention have been given careful study. Many of the usual causes of noise were eliminated in the design with the exception of the trolley wheel and the contact between wheel and rail. Wheel resonance is avoided by a device suggested by the R. D. Nuttall Company. Other noise is insulated from the car body by rubber pads between the axles and the chassis frame and by rubber shock insulators on the spring ends. Moreover, the floor includes two layers of Masonite insulation, which restricts flow of both heat and sound. The trolley base is mounted on four Lord rubber bushings, minimizing noise from that source. Motor hum is eliminated by rubber insulation on the supporting bolts, the same as used on the ventilating fan.

To obtain impartial data for comparison of different car noises, tests were made on the new four-wheel car, on an aluminum car mounted on two worm-drive trucks, and on a standard double-truck car of older type. The results of these measurements are shown in the accompanying chart. From this, it will be noted, for example, that at 10 m.p.h. the new car developed only one-seventh the noise of the standard car on the outside and about one-fifth on the inside. Comparative values for other speeds show the four-wheel unit to be much more quiet than either of the other two tested.

The exterior of the car is simple and harmonious. The roof has an elliptical profile, viewed from either end or side, and is finished in dark green canvas. It is clear of all equipment except the trolley base. The body ends are rounded with semi-elliptical curves without corner posts. Body lines are carried all around, without a break at the doors or elsewhere. The skirt is continuous and brought down to the level of the step wells, 12 in. above the rail. Side windows are arranged in three groups of three each and the end windows are 5 ft. wide. Plate glass is used throughout. Three-bar chromium plated bumpers are mounted on the ends of the body. The exterior is finished in rubbed and polished Duco, equal to the best automotive standards. Abbott gray is the principal body color, with Tonowanda green as the relief.

The car is entered at the front through a combined entrance and exit way, 52 in. wide. Two 12-in. steps, one of which is the step well, lead to the floor level of 24 in. above the rail. This is considerably lower than the usual practice. At the rear is a treadle-operated exit door. The car seats 40 passengers and has a total carrying capacity of 100. Seats are of the semi-bucket type, leather covered, with comfortable springs. The plate glass side windows are easily raised and lowered by automotive crank mechanisms. They are sashless and operate quietly in felt glass-runs. The interior is free of bulkheads, partitions and cabinets which would obstruct the view, and all mechanical apparatus, except the operator's levers and the fare box, is concealed. There are no inaccessible corners, exposed piping, mechanisms or woodwork, so that dirt is easy to remove. Electric heaters are enclosed in a continuous box on each side under the seats. Interior walls are finished in polished Duco with softer tints of the dominant colors used on the outside, except that the wainscoting, window frames and mullions are finished in natural polished aluminum. Seat coverings are in walnut brown leather and the floor is covered with Prestwood sheets of the same color.

The hydraulic pump is small in size, as shown, and weighs only a few pounds



Comparative tests of the new four-wheel car, an aluminum double-truck car with worm drive and a standard maximum traction double-truck car showed the new vehicle to be much more quiet than the other two

The car is ventilated by a motor-driven exhaust fan through grilles in the ceiling and a duct leading to an opening in the rear, where the blower is located. The blower is automatically started when the car stops and exhausts 600 cu.ft., or 40 per cent of the net volume of the car body, per minute. Fresh air enters through louvers in the front near the top, is carried along ducts in the ceiling and down the pier panels, where it enters the heater boxes at the floor level.

The car is heated electrically from two sources. Seven 700-watt shunt heaters are provided in the heater boxes and are automatically controlled by a thermostat. These heaters are used only when the car is still and in the coldest weather. The principal heating is obtained by utilizing the rheostatic losses in accelerating and the losses absorbed by the rheostats during dynamic braking. During the summer, the waste energy is dissipated in resistors exposed to the outside atmosphere. A throw-over switch is provided for directing this energy into the heaters when heat is desired.

From a Different Angle

HOW some of the problems of urban and interurban transportation appear to observers not directly connected with our own industry will be told in a series of articles which the Journal will publish during the coming year.

Among the men of national prominence who will contribute to this series are:

Dr. Julius Klein

Assistant Secretary of Commerce, whose experience with the problems of business and industry is world wide.

Frederic A. Delano

chairman of Regional Plan of New York and Environs; formerly president of the Wabash Railroad and a member of the Federal Reserve Board.

Edward Kimball Hall

lecturer on industrial relations in the Amos Tuck School of Business Administration at Dartmouth; formerly vice-president American Telephone & Telegraph Company. The man who inspired "the voice with a smile."

Col. A. B. Barber

manager transportation and communication department, U. S. Chamber of Commerce; director National Conference on Street and Highway Safety.

Joseph H. Appel

of the John Wanamaker Company, New York, who has given intensive study to the relationship between transportation facilities and retail trade.

The first article of the series will appear in the March issue

Trolley Bus System

Inaugurated in Rockford

One of the new vehicles loading at State and Church Streets in the business district

Type of residential area which the route serves. Note the overhead construction on this short-radius curve

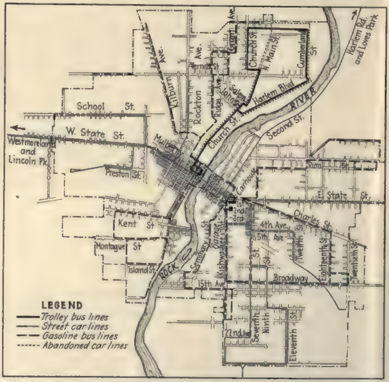
MAKING the fifth new installation of trolley buses in 1930, the Rockford Electric Company, Rockford, Ill., officially started its system with four Brill vehicles on Dec. 10. The new line replaces the North Main Street and Harlem Boulevard street car lines, and serves approximately 15,000 residents in the northeastern section of the city. The new vehicles received immediate approval by the riding public.

The route, as shown on the accompanying map, circles a two-block loop in the business district and extends north on Church Street to John Street, where a 3.61-mile loop over Harlem Boulevard, Cumberland Avenue, Van Wie Street and North Main Street begins. The entire route is provided with positive and negative trolley wires on both sides of the street, permitting operation in both directions. The actual mileage of streets served is 4.87 and the total of overhead is double this figure, or 9.74. The round-trip mileage, in either direction around the outer loop, is 5.73. The vehicles are stored at the carhouse, located at Kishwaukee Street and First Avenue, a distance of 0.62 mile from the line. Since double overhead has been installed between the line and the carhouse, the total mileage of overhead is 10.98.

For more than a year, the Rockford Electric Company had been considering a trolley bus installation but the decision was hastened by the city's plan to repave Church Street.

The overhead system was so designed that trolley bus and street car lines would cross at only one point. An electrically operated frog is used at Church and John Streets, where the large loop begins. Ohio Brass live, adjustable crossovers, equipped with insulated approaches, are used at all crossings, while O-B Type D frogs are used at turnouts. At suspension points, instead of cutting porcelain or wood strain insulators into the span wires between the conductors, two insulated hangers are inserted between the span wire and the trolley ear.

The four Brill trolley buses, built at the American Car Company's plant, have a seating capacity of 40 each and weigh 17,700 lb. Motive power is furnished by two General Electric 50-hp., 600-volt automotive type motors. The control equipment is Type PCM. The braking equipment consists of four-wheel air brakes, with hand-operated emergency disk brakes on extended armature shafts. All of the buses are equipped for trolley shoe operation. The O-B type of shoe used is of all steel construction and has a contact surface of 2 in.



Trolley bus, street car and bus lines of the Rockford Electric Company. The new trolley bus route serves 4.87 miles of street

At present, two of the buses are being used throughout the day and all four during the rush period. The free running speed of the buses is about 35 m.p.h. The present schedule speed with frequent stops during rush hours is 11½ m.p.h. In non-rush periods, it is 15 m.p.h.

Storage yard for trolley buses of Chicago Surface Lines is located alongside the North Avenue carhouse

Trolley Buses Maintained by Street Car Personnel in Chicago

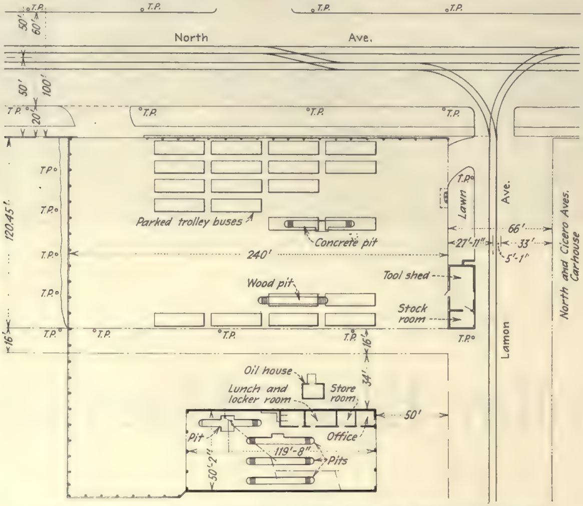
Duplication of effort is avoided by complete co-ordination of activities of all departments for operation and maintenance of rail and railless equipment

BECAUSE of the similarity in design of trolley buses and street cars and the similarity of their maintenance problems, the Chicago Surface Lines has adopted the policy of placing the care of both types of vehicle under the same supervisory force. The work is done in a building adjacent to one of the large carhouses by men who have had previous experience in street car maintenance. Procedure and methods have been systematized along much the same lines as those for the railway equipment.

The Surface Lines is at present operating five trolley bus routes totaling approximately 45 miles in length. To meet the maximum rush-hour schedule requirements, 83 vehicles are needed. The total number available is 89, leaving six spares. All the vehicles are now serviced and stored in an area specially devoted to this purpose in rear of the North Avenue carhouse.

At this location, a small building has recently been completed in which special inspection and minor repair work is done. The ordinary daily inspection work is done outdoors in the storage yard. For heavy repairs and overhaul, the buses are sent to the company's main car shops. It is planned in the near future to create additional trolley bus depots in other locations where part of the vehicles will be stored and maintained. This will permit a reduction in the amount of pull-out and pull-in mileage for routes located at some distance from the present depot.

Careful consideration has been given by the Surface Lines management to the relative merits of indoor and outdoor storage. While it is believed that indoor storage possesses certain definite advantages, these were not felt to be sufficiently great to justify the necessary investment. Moreover, there is thought to be no reason why trolley buses can not satisfactorily be stored in the open in the same way that the street cars are stored. Sufficient space is provided in the inspection building, however, for the storage of buses undergoing inspection and repair.



Layout of inspection and storage facilities for trolley buses at Chicago. Vehicles enter at left from North Avenue, receive inspection and are then directed either through maintenance shop or around loop to parking position preparatory to leaving by same gate

PREVENTION OF ROAD FAILURES THE KEYNOTE OF MAINTENANCE POLICY

Reduction of the number of road failures to the lowest possible figure is the objective of the maintenance policy. It is believed by the management that any reasonable expenditure is economically justifiable if it aids in preventing road failures. A systematic inspection system is the corner-stone of the whole maintenance program.

At the end of each day's run, the trolley bus operator turns his vehicle over to a special inspector at the North Avenue yard, and, at the same time, reports in writing the condition of the vehicle, noting any defects which may have come to his attention. The operator's report, however, is not relied upon as final because he is not considered to be an expert in mechanical or electrical matters. But his remarks are carefully considered by the inspector and special attention is paid to the examination of any parts reported defective.

The inspector then proceeds to make his examination. In so doing, he follows a definite routine. He takes the position of the operator, tests control and brake mechanisms, examines pressure gages and ammeter, turns on the interior lights and tries out signal devices. Next he examines the exterior of the vehicle, paying special attention to head lights, tires and current collecting apparatus. After having done this, he continues the test by operating the trolley bus for a short distance. If no repairs are needed, the vehicle is marked "O.K." by the inspector. It is then run around a loop and placed in position where it is ready to go out again.

If work is required to be done to put the vehicle in good operating condition, the trolley bus is run into the shop building. The inspector then submits a written report of what he has found wrong with the vehicle. His responsibility ends at this point and the correction of the defect is in the hands of the shop forces. The shop structure is wide enough to accommodate four vehicles abreast and long enough for three in line. The west end has four rolling doors which give access to the four lanes. The east end, however, has only three doors, one corner of the building having been walled off to provide a store room and office for the shop foremen. Each of the through lanes is provided with a pit of sufficient length to permit work being done on two vehicles simultaneously. Trolley buses undergoing special inspection or requiring repairs that take considerable time are placed in the lane along the south side of the shop, or in the north lane which does not extend all the way through the building and has only a short pit. Trolley buses requiring only minor repairs are moved as quickly as possible through the two center lanes and out again at the east end to be placed in the storage yard available for service.

WORK IS DONE BY MEN PREVIOUSLY ENGAGED IN STREET CAR MAINTENANCE

In general, the repair work on the trolley buses is done by a force of mechanics and electricians who have been transferred from similar work in the car shops. Motors, control apparatus, switch groups, current collecting devices, etc., are very similar in design for both trolley buses and street cars. On this account it has been found feasible to transfer these men to the new work with a small amount of special instruction. The inspectors, too, are men who have had past experience in the inspection and maintenance of railway equipment. A few specialists, however, are employed to look after steering gears, tires, axles, etc.

In addition to the inspection made at the end of the daily run, a more comprehensive inspection is made after the trolley bus has covered approximately 5,000 miles. This mileage is determined according to the schedule of service operated, and checked by the speedometer reading. As each trolley bus, under present operating conditions, averages about 100 miles per day the individual vehicle undergoes this special examination about once every six weeks.

DEFINITE AND COMPREHENSIVE PLAN INSURES THOROUGHNESS OF INSPECTION

The thoroughness of this scheduled inspection with the necessary repairs or overhaul is not left to the discretion of the maintenance personnel, but is carried out according to a comprehensive plan. A set of instructions has been prepared specifying the tests that shall be made of the various parts. Each test is numbered and a space is provided with a corresponding number on the inspection report form to be filled in as the test or repair is made. In the main, these instructions are the same for all types of trolley buses, varying only in minor ways to conform with the specifications of different makes of vehicle used on the system.

In general, the maintenance problems of the trolley buses have been found to be comparatively simple. Some difficulties were experienced at first with the current-collecting apparatus. These were largely overcome through the substitution of sliding shoes in place of trolley wheels. This change has materially reduced the weight of the apparatus required. Motors and control apparatus have been found to stand up well in spite of the poor paving on certain parts of the routes and the demands placed on the equipment by the heavy duty for which trolley buses are used in Chicago. A number of the vehicles have been operated more than 25,000 miles with no motor trouble at all.

PERFORMANCE RECORDS GOOD DESPITE LIMITED MAINTENANCE EXPERIENCE

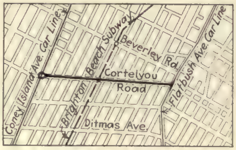
Road failures of trolley buses have been surprisingly few, considering the comparatively short time which the operating and maintenance personnel has had to become familiar with the equipment. The maintenance methods now in use are giving satisfactory results, despite the rather crowded condition existing at the company's single trolley bus depot. When the contemplated additional facilities become available, it will be possible to perform the maintenance work more effectively, but the procedure is expected to follow the same general plan that is now being followed.

Special inspection and repair work on trolley buses is done in this building

Brooklyn Patrons Approve the Trolley Bus

Flatbush Avenue terminus of the line. The overhead arrangement for reversing direction can be seen in this view

INTENDED to enable patrons of the line as well as the operating staff of the company to make a practical test of the latest development in public conveyances under actual operating conditions, the Brooklyn & Queens Transit Corporation installed a trolley bus system of an experimental nature on Cortelyou Road during 1930. The vehicle won the almost unanimous approval of the passengers who rode on it as indicated by their expressions of opinion on cards distributed for that purpose by the operators. Approximately 250 passengers filled out the cards, and of this total, 239—96 per cent—indicated that they preferred the trolley bus to other types of vehicles. Many of those who expressed their approval indicated that they preferred it to other vehicles because of its smooth riding qualities, the absence of odors from exhaust gases, the excellent illumination of the interior, its flexibility which enables it to pull into the curb to receive or discharge passengers, and its quiet operation.



The 0.75-mile route joins two car lines and crosses a subway in a densely populated residential area of Brooklyn

One patron described it as "a Rolls-Royce ride for a 5-cent piece." Another commented, "Think it is fine. Rides so smoothly, no horrid gas fumes. No bumping—very comfy. Wish there were lots more." Two more said: "I have used this line for 25 years and never had such a comfortable ride," and "A marvelous improvement in transportation and 100 per cent improvement to business."

The great majority of those who indicated their approval indicated also that they believed the present route on which it is operated is too short to demonstrate fully the merits of this new type of conveyance. One declared, "I would like a longer ride in such comfort." Approximately 25 per cent of the total who filled in the cards made definite suggestions for the extension of the route, and approximately two-thirds of these proposed that the route be extended west along Cortelyou Road to Gravesend Avenue or Ocean Parkway. The extension of the route was urged by many as necessary to provide Flatbush with more crosstown transit facilities south of Church Avenue. "One of the oldest residents and principal property owners on Cortelyou Road" urged the extension of the line in both directions. This cross-section of public opinion in Flatbush indicates that the trolley bus has met with popular favor and that there is strong sentiment among the patrons of the line for its extension, particularly to the west as far as Ocean Parkway or Gravesend Avenue.

Service was started on July 23, 1930, with one Twin Coach. It was operated in conjunction with gasoline buses for a period to allow comparison. Later, an A.C.F. trolley bus was added. Both vehicles are equipped with two 50-hp. Westinghouse motors.

The route, as shown on the accompanying map, extends from Flatbush Avenue to Coney Island Avenue, by way of Cortelyou Road, a distance of 0.75 mile. It joins two surface car lines and crosses a subway line in a densely populated residential area of Brooklyn. Temporary arrangements have been made at both termini for turning the vehicles. At Flatbush Avenue, the vehicles make a left turn onto this artery, reverse a short distance on the right-hand side of Flatbush, and then swing to the left onto Cortelyou Road again. Because Cortelyou Road has an offset at this location, the turning is accomplished without difficulty. Later, the company may construct overhead around the block to allow turning. At the Coney Island Avenue end, a temporary loop has been constructed. Should the line be extended to the west this loop will not be needed.

◆

Maintenance Contest

First period of the Maintenance Contest closed on Jan. 31. Awards of prizes will be announced soon.

Entries for the second period are now being received. All material received up to and including April 30 is eligible for this period.

Copies of the rules are available upon request.

Typical freight haulage locomotive showing use of radial draw bar coupler permitting operation on sharp curves

Selecting FREIGHT LOCOMOTIVES *for Interurban Lines*

By
H. C. HICKOCK
Railway Engineer
Westinghouse Electric & Manufacturing Company

Proper choice of motive power will permit the haulage of considerable amounts of freight without an increase in the power supply of the average interurban railway

HAULAGE of freight by interurban railways is gaining attention as a means of making more intensive use of the system to increase gross revenue. Naturally, it is essential to minimize the initial investment for freight service. The locomotive characteristics should be chosen to fit in with the existing facilities if possible, since any considerable rearrangement of substations, feeder, or track may not be feasible. These facilities and the service desired are the chief factors which determine the weight, capacity, and characteristics of a locomotive. If the service requirements dictate a locomotive too large for the substation capacity, feeder capacity, bridge structures, or track, a choice must be made between increasing the capacity of the system and the use of a greater number of smaller locomotives.

The power systems of most interurban roads were installed for the operation of passenger trains of one to three cars of 30 to 50 tons each, running at comparatively high speeds on single track, at headways of two to three hours. For an interurban road, with its comparatively infrequent train operation, the investment in substations and distribution systems is a large part of the total. Consequently, it is an economy to operate the freight trains so as to obviate additional investment for substations and overhead. This usually requires slow freight train speed, which keeps the power demands to a minimum. Where, however, a large movement of freight is contemplated, the investment in rolling stock becomes an appreciable element and must be kept within economical limits. This is accomplished by high-speed operation, which also reduces train crew expense.

These points are shown best by a specific comparison of the performance of two 50-ton locomotives, one with slow-speed motors and the other with similar high-speed motors. For most interurbans this size of locomotive meets the average freight requirements. With good track on a 1 per cent grade, a 50-ton locomotive can start a trailing load of 575 tons or ten to twelve loaded freight cars.

The motor speeds chosen are, at their one-hour ratings, in the ratio of approximately five to nine. Both motors have the same gear ratio and are mounted on wheels of the same diameter. The diagram shows their comparative performance. The one-hour horsepower ratings of these two motors on short fields are respectively 100 and 180. A 50-ton locomotive equipped with four such motors geared 17 to 60 and mounted on 36-in. wheels would have the following ratings:

		Current, Amp.	Speed, m.p.h.,	Tractive Effort, Lb.
At one hour rating:	Slow-speed locomotive.....	588	11.5	13,100
	High-speed locomotive....	992	21.0	12,500
At continuous rating:	Slow-speed locomotive...	460	13.0	9,200
	High-speed locomotive...	720	24.6	8,000

In the above comparison, although the continuous tractive effort of the high-speed locomotive is 87 per

Standard 60-ton Baldwin Westinghouse locomotive hauling a train of 24 loaded cars on the Aroostook Valley Railroad

cent of that of the slow-speed one, its continuous current demand is 68 per cent more.

For illustration, consider a 50-mile road with 70-lb. rails and supplied from a 600-volt line. The equivalent grade over the entire distance is 0.4 per cent, and the ruling grade 1.75 per cent, but sufficiently short to have no appreciable effect on locomotive motor heating or substation or feeder capacity. On the 1.75 per cent grade, with 25 per cent adhesion, a 50-ton locomotive can start and accelerate at 0.1 m.p.h.p.s., a trailing load of 425 tons, which includes a net freight load of about 250 tons.

For reasonable service, an average line potential of 500 volts while drawing power is required at the locomotive. This allows a 16.7 per cent (100 volts) average drop in the distribution system, and is believed sufficiently high to make the copper feeder costs reasonably low, although no investigation has been made on this point. Any slight change would not affect the number of substations.

The average running tractive effort necessary to haul a 425-ton trailing load over the assumed profile is 7,520 lb., or 1,880 lb. per motor. From the motor characteristic curves the power requirements and speeds are as follows:

	Slow-Speed	High-Speed
Current per motor, amp.	101	170
Current per locomotive, amp.	404	680
Speed at 500 volts, m.p.h.	11.5	20.2
Load at substation (600 volts), kw.	242	408
Load at locomotive (500 volts), kw.	202	340
Loss in line, kw.	40	68
Demand at substation for starting train, kw.	350	590

Hence the slow-speed train can be supplied from a 300-kw. substation. The station overload capacity, which is 100 to 200 per cent, will care for the heavy starting requirements, haulage up individual grades, and meeting of trains. Allowing the same margin, the high-speed train would require commercial 500-kw. machines.

It will be noted that the line loss is greater for the high-speed train, being proportional to the locomotive current for the same voltage drop. This may call for more feeder copper and reduced substation spacing to keep the line voltage drop down for the high-speed train. Otherwise it may influence the decision as to the type of service. This does not mean, however, that the energy consumption will be appreciably greater for the high-speed service, because the shorter running time will practically offset the higher demand.

Substation spacing and amount of feeder copper, therefore, are factors which enter the problem. The number of substations and the feeder copper required for infrequent interurban passenger service are determined primarily by line voltage rather than by capacity. In the example cited, calculations of the relative costs of substations and feeders to provide for an average line potential of 500 volts, indicate the following arrangement for maximum economy, with infrequent movements of freight by two or three locomotives:

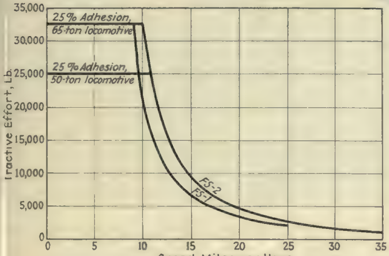
	Slow-Speed	High-Speed
Number of substations, exclusive of spares	5	6
Substation spacing, miles	10.7	8.8
Substation capacity, kw.	300	500
Feeder size, circ.mils	400,000	700,000

To show further the difference which speed makes in freight haulage, a comparison may be made of the investment and operating costs with slow-speed trains and with high-speed trains. In this will be considered only those factors which vary appreciably with the speed. The cost of complete 300-kw. substations may be taken as $25,000, and of 500-kw. stations as $30,000, and the feeder at 20 cents per pound installed. The substation and distribution system investment for slow speed is $190,500 and for high speed is $294,000; or the slow-speed power installation costs 64.8 per cent as much as for high speed.

The locomotives, and hence the investment, may be less for high-speed operation where the freight traffic is sufficient to require several locomotives. The first cost of a high-speed locomotive is only slightly more than for the corresponding slow-speed machine, the excess being principally for larger control equipment for the greater currents handled. The investment for locomotives is more directly related to the freight traffic than is the distribution system. If the freight cars are owned by the railroad, the high-speed operation would effect a saving where traffic is heavy. No purchase of freight cars is considered here.

The annual operating expenses which, aside from the charges on the investment, are directly influenced by the type of freight service may be classified under three main items, power, crews, and maintenance.

Multiple-unit operation of two 42-ton Baldwin Westinghouse locomotives on the Niagara Junction Railway



Performance of typical freight locomotive motors. Plotted for 500 volts with gear ratio 17:60, 36-in. wheels

Based on the average energy consumption of the two ocomotives when hauling rated tonnage, and with energy n the high-tension alternating-current side of the subtation at 1 cent per kilowatt-hour, the annual cost of ower can be estimated for any tonnage assumed.

Crew expense varies principally with speed. Excludng stops and switching, a locomotive capable of opering at twice the speed of another will make a run in alf the time, saving 50 per cent in crew for a given daily tonnage, as well as using only half of the locomoives needed for the slow run. In practice, because of witching and delays independent of locomotive speed, he time can seldom be reduced by half. The relative imes for the 50-mile run, without stops, are approximately 4½ hours and 2½ hours. With one hour for witching, and a half hour in layover at each end, the ound trip requires twelve hours and eight hours, respecively. The crew costs per trip at $4 per hour, with ime-and-a-half after eight hours, are $56 and $32.

In a 24-hour day, the high-speed locomotive can make hree round trips, or move 750 tons of freight in each direction, which is equivalent to 75,000 net ton-miles. The slow-speed engine can do but two round trips per day, 500 tons of freight, and 50,000 ton-miles. If 1,500 ons of freight must be moved in each direction every 24 hours, two high-speed locomotives and two crews, r three slow-speed locomotives and three crews, are equired. Not only is the crew expense increased, but he investment in locomotives is increased 50 per cent or the slow operation.

Table I summarizes the costs under the two plans based on the daily movement in each direction of 250 tons, 500 tons and 1,500 tons. In each instance it is assumed that the trailing load per train will total 425 tons, which comes within the ratings of the 50-ton locomotives. No allowance is made for passenger service nor for any investment other than locomotives. substations and feeder copper. If freight cars are to be purchased an addition should be made for them. The substation and feeder arrangement have not been changed because of the additional freight trains. Substation efficiency has been taken as 90 per cent.

Table I—Comparison of Slow-Speed and High-Speed 50-Ton Locomotives for Freight Haulage on Interurban Railroads

Freight hauled daily in each direction, tons	250		500		1,500	
Type of service	Slow speed	High speed	Slow speed	High speed	Slow speed	High speed
Number of locomotives	1	1	1	1	3	2
Number of substations	5	6	5	6	5	6
Substation rating kw.	300	500	300	500	300	500
Size of feeders, circ. mils	400,000	700,000	400,000	700,000	400,000	700,000
Investment:						
Locomotives	$29,000	$30,000	$29,000	$30,000	$87,000	$60,000
Substations	125,000	180,000	125,000	180,000	125,000	180,000
Feeder	65,500	114,000	65,500	114,000	65,500	114,000
Total investment	$219,500	$324,000	$219,500	$324,000	$277,500	$354,000
Annua charges on investment:						
Interest, taxes, insurance, depreciation totaling 12 per cent	$26,300	$38,900	$26,300	$38,900	$33,300	$42,500
Annual operating costs:						
Crews (all over eight hours at 1½ rate)	$17,360	$9,920	$29,760	$19,840	$89,280	$59,520
Power	10,000	11,200	20,000	22,400	60,000	67,300
Maintenance (2½ per cent on investment)	5,480	8,100	5,480	8,100	6,930	8,850
Total operating cost	$32,840	$29,220	$55,240	$50,340	$156,210	$135,670
Total annual costs	$59,140	$68,120	$81,540	$89,240	$189,510	$178,170
Low-speed cost in per cent of high-speed cost	86.8	....	91.5	....	106.3	....

The comparison shows the economy of faster movement where the tonnage is sufficiently heavy to demand additional 50-ton locomotives. If the weight limitation is removed to permit locomotives capable of hauling heavier loads, it is possible, at slow speeds, to move a given tonnage within the same time as with the high-speed equipment and with the same number of engines.

Considering the specific case of moving 1,500 tons as in the foregoing, a 75-ton locomotive can haul a train of 640 tons or 375 tons of net freight over the assumed profile. Hence, with four round trips a day, it is possible to transport 1,500 net tons of freight in each direction requiring two slow-speed 75-ton locomotives similar to the 50-ton type.

The necessary running tractive effort is 11,320 lb. and the power demands are as follows:

Current per locomotive, amp.	600
Speed at 500 volts, m.p.h.	11.5
Load at substation (600 volts) kw	360
Load at locomotive (500 volts), kw	300
Loss in line, kw	60

Although substations smaller than 500 kw. might be adequate, the 500 kw. is the size most usually installed. The margins in substation equipment are not quite comparable but this slight inconsistency is not a deciding factor. The most economical arrangement for supplying an average of 500 volts to the 75-ton locomotive train would be five substations spaced 10.7 miles apart, and 750,000-circ.mil feeder.

Using the same basis as previously, but with a slight reduction in unit cost for the larger locomotives, Table II represents the chief investment and operating costs of this scheme:

Table II—Cost of Hauling Freight with 75-Ton Locomotives.

Freight handled in each direction, tons	1,500
Type of service	Slow speed
Number of locomotives (75-ton)	2
Number of substations	5
Substation rating, kw	500
Size of feeders, circ.mils	750,000
Investment:	
Locomotives	$84,000
Substations	150,000
Feeder	122,400
Total investment	$356,400
Annual charges on investment:	
Interest, taxes, insurance, depreciation totaling 12 per cent	$42,800
Annual operating costs:	
Crews	$59,520
Power	59,600
Maintenance (2½ per cent on investment)	8,910
Total operating cost	$128,030
Total annual costs	$170,830

The annual costs of the heavy, slow-speed train are less than for the smaller trains, because of reduced crew expense and low power demands.

Spare equipment is also a factor in the investment costs, depending on the reliability desired. For two or three active locomotives, only one spare would be needed, but this is 50 per cent or 33⅓ per cent spare equipment. Similarly, for substations the spare equipment will vary. While serious consideration must be given to spare equipment, the foregoing comparisons show the trend of costs as affected by different methods of operation. The necessity to have locomotive characteristics suited to the service is shown from the standpoint of economy. The comparison naturally is somewhat theoretical, and local conditions will influence methods of operation. It is quite possible, with business confined to l.c.l. freight where the tariff is comparatively high and the tonnage is light, that the additional revenue may more than offset the increased cost of high-speed service.

Switching duty, which involves many slow movements, can best be performed by slow-speed locomotives with high starting tractive effort.

A very satisfactory arrangement sometimes employed on 600-volt lines is to equip a locomotive with high-speed motors, arranged for series, series-parallel and parallel connections. Such a locomotive is very flexible in that it is capable of operation at both high and slow speed. Other features included in standard electric locomotives, such as multiple-unit control, make them adaptable for a wide range of conditions.

Thus an existing road with adequate substation and feeder capacity for its passenger service can haul considerable freight for a small additional investment in locomotives and terminal facilities, perhaps 3 to 10 per cent of the existing plant cost. The extra annual costs for freight haulage would, therefore, be confined chiefly to freight crews, power, locomotive maintenance and the charges on the locomotive investment.

It is seen that a 50-mile line with substations of but 300 kw. can handle some 1,500 tons of net freight in each direction daily. In fact, with the trains properly spaced so as to meet half way between substations, five trains could be operated, each making two round trips per 24-hour day, and yet keep the average substation load equivalent to that for one train. This would permit the transportation of some 2,500 tons net in each direction daily. The continued operation of passenger trains, however, would probably confine most of the freight movements to night service.

S.A.E. Recommends Grading Motor Oil by Viscosity Numbers

IN ORDER to improve on the practice of grading oil by such inadequate terms as light, medium, heavy medium, heavy, etc., the society of Automotive Engineers has recently adopted as recommended practice a system for grading in the interest of a more intelligent understanding of the importance of the right viscosity for any set of engines or operating conditions. The petroleum industry and automotive manufacturers have concurred in the new system, which lists oils by viscosity numbers as indicated in the following table:

Viscosity Number	Viscosity Range Saybolt Universal, Seconds	
	At 130 Deg. F.	At 210 Deg. F.
10	90–120	....
20	120–185	....
30	185–255	....
40	255–	–75
50	....	75–105
60	....	105–125
70	....	125–150

As noted, the measured viscosity in seconds by the Saybolt universal viscosimeter is taken at 130 deg. and 210 deg. F., to provide a knowledge of the relative change in fluidity between average operating crankcase temperatures. Obviously, the adoption of this system will go far to eliminate the necessity for using descriptive terms such as light, medium, heavy, etc., which at best are decidedly misleading. On the other hand, it must be noted that S.A.E. numbers cannot be taken as a criterion of quality, as they classify oils in terms of viscosity only.

In the case of prediluted oils, S.A.E. viscosity numbers by which the oils are classified shall be determined by the viscosity of the undiluted oils. Wherever the S.A.E. viscosity numbers are used on prediluted oils, the container label should show in some suitable manner that the S.A.E. number applies to the undiluted oils.

By T. F. PERKINSON
Transportation Engineering Department
General Electric Company

50-ton, 600-volt locomotive with steeple cab

75-ton, 1,200-volt locomotive with freight train

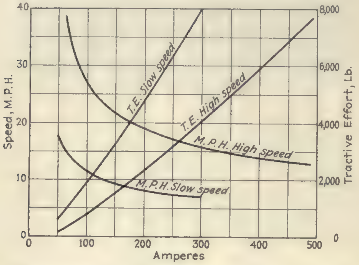
Desirable Features of Locomotives for Interurban Freight Service

Many factors are involved in the determination of the type of motive power which should be used for handling small amounts of freight on interurban railways. Some of the more important are discussed in detail

SHORT-HAUL freight on interurban electric railways, both less-han-carload and carload business, as well as industrial switching and transfer work, have assumed such proportions that additional motive power equipment on some lines is an immediate necessity. A number of roads have met the contingency by utilizing trucks, motors and control equipment originally built for passenger cars in locomotives of their own construction. These locomotives have been successful within the limited fields for which they are suitable. Generally a change in gear ratio is necessary to adapt motors which are inherently high-speed machines to the slower speeds encountered in freight service. Forced ventilating apparatus for the traction motors has frequently been found desirable.

The available equipments are frequently of doubtful age and consequently undesirable for locomotives. Moreover, the size of the motors is generally such that their use in locomotive service results in either uneconomically small units or underpowered units of the weights that seem to be most suitable for interurban freight haulage. Experience gained by a number of roads indicates that locomotives of approximately 30 to 45, and less often 50, tons weight are practicable when utilizing old car equipments.

Where the volume of business is sufficiently large, it is less economical to move the tonnage in small trains, and machines as heavy as 75 tons become desirable. The use of such sizes generally requires the purchase of new motors, control, blowers, trucks and other equipment, and the construction of new locomotives by the operating company themselves or the purchase of complete units from a locomotive manufacturer. Since strict economy in the matter of acquiring additional motive power is usually imperative, one of the essential features of any new equipment is that it have a relatively low first cost without sacrificing reliability and performance characteristics.



Speed-tractive effort characteristics of typical 600-volt slow-speed locomotives, equipped with four 175-hp. motors, 70/15 gear ratio, 38-in. wheels

The combination of comparatively light rails and substations, the capacities of which were originally fixed by power demands of passenger car equipments, practically limits the size of four-axle locomotives to a maximum of 65 or 70 tons on a majority of the small interurban roads. A further limitation is generally encountered in current collection. Many of these roads are equipped with overhead construction of a type that precludes the use of a slider type of current collector. As a result, with wheel collectors successful current collection at 600 volts without excessive maintenance is practically impossible on locomotives of more than 65 or 70 tons.

Not only does current collection limit the locomotive size, but voltage drop also plays an important part. The conductivity of the contact and feeder system and the spacing of the substations are usually laid out to provide adequate system voltages when the current drafts are of the order of those encountered with interurban cars. With the power requirements of locomotives in slow-drag freight service, however, the voltage drops become proportionately greater and may seriously handicap or prevent entirely the operation of control and auxiliary equipment. With locomotives equipped with the electro-magnetic type of contactors actuated directly from the line or through suitable resistors, the current drafts should be limited to those which will not cause the line voltage to fall below approximately half nominal voltage, the minimum value at which the contactors will "pick up" at rated operating temperatures.

Where a secondary energy source, i.e., a motor-generator or storage battery is used for control energy, or where electro-pneumatic contactors are employed, low trolley voltage does not affect the control equipment so much. Low voltage does, however, seriously interfere with the operation of the locomotive, since subnormally low-speed running with prolonged traction motor heating and consequent accelerated deterioration of insulation are inevitable. Where the motors are of the self-ventilated type, the heating is further aggravated by the absence of sufficient ventilating air. With external ventilation by motor-driven fans, low line voltage also brings low fan speed and a reduction in the volume of ventilating air.

When a large portion of the total operating time is spent in low-speed service, it is highly desirable to use forced ventilation to the propulsion motors if the most efficient use of the material in them is to be realized. External blowing is particularly advantageous where the service consists of mixed switching and transfer or freight runs. In the switching portion of such duty cycles, the currents are heavy and frequent, due to many accelerations, and motor speeds insufficient to provide adequate self-ventilation are involved.

On many existing interurbans, location engineers had to run between station points with a minimum of cut and fill, and there was no particular objection to sharp curvatures, except for high-speed lines. Even on high-speed roads with reasonably low curvature between stations, the presence of short-radius curves within city limits makes imperative the use of rolling stock with short rigid wheelbases and the simplest combinations of wheels and truck structures.

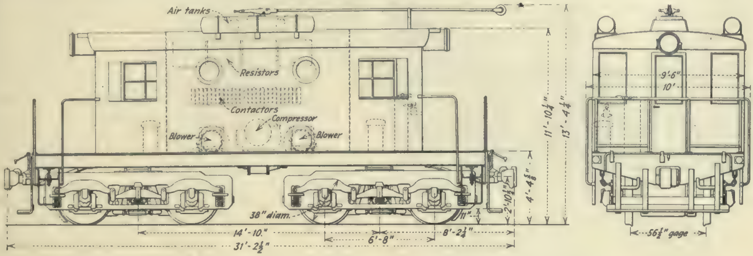
The simple B—B type of locomotive, with two non-articulated, two-axle swivel trucks, has found practically universal adoption for interurban line haulage and switching. The B+B type, with trucks articulated and buffing and hauling stresses transmitted through the truck structures exclusively, has a rather limited field because of its higher cost. The success of the non-articulated type, even up to 125 tons, has demonstrated that the expense of articulation in such classes of service is in general unwarranted.

The majority of interurban roads on which a freight haulage business has been or is being built up handle standard steam railroad rolling stock in interchange or through-haul service. The requirements of draft rigging and couplers are the same as those found on trunk lines. The standard MCB swivel-butt coupler, with a short shank pivoted in a casting fastened to the bumper structure, will permit negotiation of any curvature that ordinary freight cars in trains will pass through without danger of derailment. Where industrial sidings or spurs of extremely sharp curvature involving track radii below 175 ft. (33 deg.) are encountered, the handling of cars generally requires the use of either a radial type of coupler or an extension drawbar in connection with the swivel-butt, short-shank coupler.

There are two types of cab construction in general use, each of which has its merits. The steeple type and its variants, and the semi-steeple or semi-box, have found the most widespread adoption. The advantages of visibility in all directions from the operator's position and ease of changing operating positions quickly are more desirable in certain classes of switching service than for road service, since the vision to the rear is usually obstructed by the presence of box cars directly behind the locomotive. The many constructional advantages of the box and semi-box types indicate that these will be used the more widely in the future.

With the steeple type of cab, the locating of auxiliary and control apparatus in low and sometimes narrow-end cabs with restricted vertical and lateral space has necessitated elongated platform construction. The box construction permits not only centralization of equipment, but utilization of vertical space, with a resultant decrease in platform length, and tends to lower construction costs.

The centralization of equipment within the main cab of the box type gives accessibility to contactors, switches, blower motors, compressors, etc., and encourages frequent inspection and consequent better maintenance. Segregation of the control and auxiliary apparatus prevents much of the noise from compressors and blowers from reaching the operator. In addition, a minimum amount of energy is required for cab heating purposes, and the cab temperature is more easily regulated. With this arrangement the heat occasioned by losses in accelerating grids during repeated switching movements in warm weather is excluded from the operator's compartment.



Side and end elevation of typical box cab locomotive, 50 to 70 tons

The axle-hung, single-reduction, geared motor has proved the most desirable type for small locomotives such as those under consideration. Maximum reduction gearing and relatively slow speed motors combine to produce low-speed, low energy-consuming tractive power.

Where higher speeds are desirable and practicable, field control of the motors is available. Of the two methods of securing reduced field—field tapping and field hunting—the latter is preferable from the viewpoint of notor stability. Inductive shunts in parallel with the ields render the propulsion motors less susceptible to lashover with sudden changes in line voltage.

Continuous motor capacity of approximately 7 hp. per on of locomotive, with 9 hp. per ton for the hourly ating, has been satisfactory on numerous railways. Continuous motor ratings sufficient to give locomotive ractive effort corresponding to an adhesion factor (the ratio of the tractive effort exerted by the locomotive to he weight on drivers) ranging from 9 per cent to 11 per cent are high enough to insure reasonable freedom from notor failures due to overheating. The corresponding hourly adhesion factors are approximately 50 per cent higher than the continuous factors.

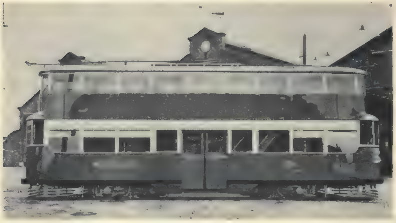
Not a few interurban road locomotives have provision or but two operating combinations of the motors, that s, series-parallel and full parallel. A third combination —full series—often permits heavy drags on steep grades at low speeds without an undue demand on the power ystem or without excessive line drop, which frequently would be impossible with a two-speed locomotive without educing the size of train. Within practical limits the larger the number of operating speeds and accelerating points, the more economical will be the locomotive. Use of many accelerating points involves small increments of tractive effort with consequent lighter power demands, less rheostatic losses, and less strain on draft gear equipment. With three operating speeds instead of two, a given locomotive is more readily adapted to various grade, load and power demand conditions, and so forms a more flexible transportation tool. Additional running points for each of the various motor combinations may be obtained by the use of field reduction, discussed in a foregoing paragraph.

The method of supporting the overhead contact line determines the type of collector in so far as it permits or precludes the pantograph or bow slider types. In many installations the contact wire suspension fittings have the points of attachment for the supporting wires at the same level as the contact wire and hence permit the passage of wheels and sliding shoes of restricted width only. For switching duty involving frequent reversals of direction of motion, the pantograph is preferable wherever it can be used, and eliminates the possibility of "stubbing" or the need for a trolley-pole attendant. Patent sliding shoes with or without anti-stubbing devices also have been used.

The conventional wheel trolley ordinarily will be satisfactory and has much to recommend it because of low first cost and ease and low cost of maintenance. With it successful current collection without excessive maintenance depends largely on the train speed. Available data indicate that the maximum permissible current for a single wheel is from approximately 1,000 amp. at speeds of 5 m.p.h., to 600 amp. at approximately 25 m.p.h. Sometimes the use of two poles and wheels in multiple is advisable, with a resultant reliable collecting capacity somewhat below what might be expected of two collectors.

Air compressor capacity ranging from 35 to 100 cu.ft. displacement per minute has been found by experience to meet requirements in interurban road and switching service of locomotives ranging from 40 to 70 tons. The capacity required for any particular installation will, of necessity, be determined by such elements as the presence of long grades requiring considerable braking during their descent, the amount of switching involved, the class of equipment handled, etc. Where capacities greater than 35 or 50 cu.ft. are required, it is deemed advisable, in the interest of reliability of air supply, to furnish two machines, each of one-half the total capacity required.

London Tries
Center-Entrance Tramcar



One of 99 center-entrance, double-deck cars just developed for use on the London tramway system

EXPERIMENTS with new types of tramcars continue in London. The Metropolitan Electric Tramways has embodied the results of its latest work in the production of 45 double-deck cars for use on the London United Tramways, with which it is affiliated, and 54 cars for its own lines.

Probably the most striking feature of the car is the use of a center entrance. In appearance, the car follows to some extent the American center-entrance type, modified for double-deck service.

The underframe is built up of mild steel rolled sections, plates and pressings. The underframing is quite shallow on account of the low floor. The total length of the car is 40 ft. 3¾ in. and its maximum width 7 ft. 2 in. The height from rail to top of roof is 14 ft. 7 in., while inside the height from floor to ceiling is 6 ft. 2 in. for the lower deck and 5 ft. 11 in. for the upper deck.

Since traffic in London is left-hand, and the cars are double-ended, the doors on the left side are used, and the stairways are so placed that the one on the left side is behind the center door. The conductor is stationed opposite the entrance.

The car seats 70 passengers. The lower deck has 28 longitudinal and cross seats upholstered in moquette, while the upper deck has 42 longitudinal and cross seats upholstered in blue leather.

In the lower deck five of the windows on each side have the top sash hinged to open inwards for ventilation. All of the windows on the upper deck are arranged so that the top sash will drop.

At each end, the motorman's compartment is raised above the floor of the car to give a clear view ahead, and also when the motorman looks back into the car. Behind the motorman is a partition, glazed above the waist line and with curtains fitted to the windows. A swing door in the partition carries a hinged seat for the motorman. An adjustable louvre-type windshield can be opened or closed. A hinged sash opens inward on either side of the compartment. All the windows in the car ends are glazed with safety glass.

The base of the controller is set below the floor so that the top is at a convenient height when the motorman is seated. The controller, air and hand brake, sander, sliding doors and fender control mechanism are all within convenient reach of the motorman. In addition, the lighting switches and fuses, automatic circuit breakers, signal bells, line contactor, compressor switch and indicator control mechanism are in the compartment.

The center doors on each side of the car are closed by a pair of air-operated doors that slide into pockets in the side walls. Sensitive edges prevent injury to passengers or their clothing. The doors are controlled by the motorman and the conductor by push buttons. By means of interlocks the car cannot be started until the doors are closed, and the doors cannot be opened if the car is moving at a speed of more than 2 m.p.h. An emergency handle over each pair of doors permits release of air from the engine so that they can be pulled apart by hand. An operating valve permits the doors to be opened from outside the car. Electric push button signals are placed on both upper and lower decks. Pneumatic bells are used for signals.

Power is furnished by four 35-hp. motors. The pair of motors on each truck has the armatures and fields permanently connected in series.

The car has Westinghouse straight air brakes, with the cylinders synchronized so that brakes are applied on both trucks simultaneously. An emergency valve placed over each pair of doors permits passengers to apply the brakes in an emergency. Magnetic track brakes are fitted to the trucks, but are not interconnected with the wheel brakes. Peacock staffless hand brakes are controlled from each motorman's compartment. Compressed air for operating the brakes, sanders and doors is furnished by a totally inclosed two-stage rotary-type motor-driven air compressor mounted under the car. This has a capacity of approximately 11 cu.ft. of air per minute at 100 lb. per square inch.

The lighting is by 24 lamps in the lower deck, four in the center well and twenty in the upper deck. A depressible beam headlight on the front of each dash can be operated by the motorman. A caution light in the center of each dash immediately above the headlight is operated by the motorman to warn oncoming motor vehicles that the car is about to stop, and it also is operated automatically by the doors. Two police lights of clear glass on the front and one of red at the left rear end of the car are installed. The maximum number of lamps that can be lit at any one time is 60.

The trucks are of the swing bolster type, built up of mild steel plates and sections. The design of the truck bolsters is such that a predetermined weight is carried on the side bearings with a view to eliminating rolling of the car bodies. The wheelbase is 4 ft. 9 in. and the wheels have a diameter of 24 in. The car is mounted with roller bearing journal boxes with ball bearings at the ends. Single block wheel brakes are fitted on the trucks.

Destination and route signs of the roller curtain type are operated by the motorman by means of gears.

Monthly and Other Financial Reports

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
San Diego Electric Railway, San Diego, Cal.					
November, 1930......	118,988	....	....	....	*15,876*
November, 1929......	132,430	....	....	....	*7,023*
11 mo. end. Nov., 1930	1,435,817	....	....	....	*119,086*
11 mo. end. Nov., 1929	1,483,896	....	....	....	*76,483*
Market Street Railway, San Francisco, Cal.					
December, 1930......	775,508	639,249a	....	136,259	83,460d
December, 1929......	817,254	676,519a	....	140,735	83,481d
12 mo. end. Dec., 1930	9,196,340	7,822,222a	....	1,374,118	720,237d
12 mo. end. Dec., 1929	9,590,194	8,041,926a	....	1,548,268	837,513d
Northwestern Pacific R.R., Sausalito, Cal.					
November, 1930......	333,193	385,870	35,847	*88,547*	*97,564b*
November, 1929......	461,109	467,393	36,539	*42,861*	*44,178b*
11 mo. end. Nov., 1930	5,243,214	4,645,319	395,814	201,704	106,446b
11 mo. end. Nov., 1929	5,792,556	4,940,273	412,114	439,756	390,485b
Chicago Surface Lines, Chicago, Ill.					
December, 1930......	4,846,000	3,984,572a	....	861,427	767,348g
December, 1929......	5,272,651	4,074,317a	....	1,198,324	909,743g
11 mo. end. Dec., 1930	52,160,957	43,499,978a	....	8,660,979	....
11 mo. end. Dec., 1929	56,711,239	44,440,683a	....	12,270,556	....
Indianapolis Street Railway, Indianapolis, Ind.					
10 mo. end. Oct., 1930	3,656,752	3,093,648	....	563,104	....
Boston Elevated Railway, Boston, Mass.					
November, 1930......	2,579,899	1,927,347	138,859	516,615	*185,317*
November, 1929......	2,877,280	1,982,281	138,018	761,223	64,148
Eastern Massachusetts Street Ry., Boston, Mass.					
December, 1930......	670,964	517,346	*483*	165,019	20,841
December, 1929......	761,868	495,262	12,959	264,902	130,462
12 mo. end. Dec., 1930	7,829.407	5,234,063	300,405	2,419,726	436,871
12 mo. end. Dec., 1929	8,579.454	5,442,755	351,182	3,015,261	1,000,703
Department of Street Railways, Detroit, Mich.					
December, 1930......	1,610,179	1,375,196	65,307	179,233	23,052
December, 1929......	2,078,954	1,773,879	65,457	248,354	104,434
12 mo. end. Dec., 1930	21,123,786	17,872,755	774,563	2,596,270	857,165
12 mo. end. Dec., 1929	26,444,874	21,057,542	750,948	4,754,779	3,103,189
Illinois Terminal Company, St. Louis, Mo.					
November, 1930......	542,672	396,566	34,341	111,757	80,529b
November, 1929......	610,105	436,208	23,318	150,573	104,728b
11 mo. end. Nov., 1930	6,913,510	4,804,219	336,854	1,772,309	1,323,500b
11 mo. end. Nov., 1929	7,485,423	5,213,043	258,528	2,013,719	1,484,538b
Fonda, Johnstown & Gloversville R.R., Gloversville, N. Y.					
November, 1930......	72,024	61,514	4,800	9,704	*21,171*
November, 1929......	83,615	62,168	4,300	22,825	*8,198*
11 mo. end. Nov., 1930	830,217	676,537	52,800	184,142	*157,407*
11 mo. end. Nov., 1929	930,295	695,675	79,160	271,229	*77,872*
Brooklyn-Manhattan Transit System, New York, N. Y.e					
December, 1930......	5,065,484	3,192,282	354,681	1,586,768	814,788
December, 1929......	5,199,104	3,400,231	303,977	1,565,568	798,552
6 mo. end. Dec., 1930	29,446,793	19,117,671	1,989,781	8,747,467	4,115,845
6 mo. end. Dec., 1929	30,409,954	20,422,091	1,900,208	8,508,960	3,851,131
Brooklyn & Queens Transit System, New York, N. Y.					
December, 1930......	1,920,463	1,447,344	113,606	373,839	250,893
December, 1929......	2,002,528	1,545,106	117,519	361,349	236,588
6 mo. end. Dec., 1930	11,295,205	8,807,968	636,304	1,936,736	1,191,665
6 mo. end. Dec., 1929	11,935,555	9,419,520	682,989	1,961,748	1,212,144
Hudson & Manhattan R.R., New York, N. Y.					
December, 1930......	1,060,614	419,109a	....	641,505	306,321
December, 1929......	1,112,472	507,425a	....	605,047	272,289
12 mo. end. Dec., 1930	12,204,363	6,052,898a	....	6,151,465	2,138,679
12 mo. end. Dec., 1929	12,517,756	6,248,097a	....	6,269,659	2,247,210
Interborough Rapid Transit Co., New York, N. Y.					
December, 1930......	6,477,864	3,991,419	202,896	2,283,548	*293,152f*
December, 1929......	6,511,920	3,833,653	201,184	2,477,082	*198,880f*
6 mo. end. Dec., 1930	35,008,891	23,207,341	1,202,414	10,599,135	*1,820,092f*
6 mo. end. Dec., 1929	35,749,805	22,495,993	1,202,433	12,051,378	*929,179f*
Long Island R.R., New York, N. Y.					
November, 1930......	2,954,624	2,063,789	185,469	705,247	483,180b
November, 1929......	3,084,453	2,460,962	171,242	451,390	255,447b
11 mo. end. Nov., 1930	36,691,389	24,155,664	3,000,104	9,524,578	7,671,980b
11 mo. end. Nov., 1929	38,215,910	25,323,733	2,769,978	10,104,188	8,302,234b
Staten Island Rapid Transit Co., New York, N. Y.					
November, 1930......	178,652	143,108	18,500	16,685	10,788b
November, 1929......	216,406	147,545	15,000	53,861	54,954b
11 mo. end. Nov., 1930	2,270,485	1,684,987	191,500	392,078	292,135b
11 mo. end. Nov., 1929	2,441,623	1,801,677	191,800	448,129	383,289b
Third Avenue Railway System, New York, N. Y.					
December, 1930......	1,438,752	1,010,060	96,189	265,269	26,250
December, 1929......	1,490,895	1,201,181	97,881	207,455	*30,369*
6 mo. end. Dec., 1930	8,476,708	6,543,932	565,637	1,511,697	75,750
6 mo. end. Dec., 1929	8,882,120	7,233,531	573,773	1,225,993	*210,204*
Cincinnati Street Railway, Cincinnati, Ohio					
December, 1930......	686,663	455,453	61,504	184,937	*8,125*
Galveston-Houston Electric Ry., Houston, Texas					
December, 1930......	36,166	27,949a	....	8,217	....
December, 1929......	42,559	28,461a	....	14,098	....
12 mo. end. Dec., 1930	501,041	330,720a	....	170,321	*99,343*
12 mo. end. Dec., 1929	584,490	361,377a	....	223,113	*46,654*
Houston Electric Co., Houston, Texas					
December, 1930......	258,219	180,678a	....	77,541	....
December, 1929......	286,365	181,920a	....	104,445	....
12 mo. end. Dec., 1930	3,092,816	2,212,811a	....	880,005	524,458
12 mo. end. Dec., 1929	3,375,858	2,359,732a	....	1,016,126	629,190

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
Calgary Municipal Railway, Calgary, Alta.					
11 mo. end. Nov., 1930	874,988	582,522	....	223,104d	2,756
11 mo. end. Nov., 1929	....	....	....	....	38,954
Edmonton Radial Railway, Edmonton, Alta.					
11 mo. end. Nov., 1930	740,914	500,075	....	186,839d	*3,320*
11 mo. end. Nov., 1929	....	....	....	....	9,558
Lethbridge Municipal Railway, Lethbridge, Alta.					
10 mo. end. Oct., 1930	44,468	40,416	....	4,052	*21,796*
10 mo. end. Oct., 1929	....	....	....	....	*16,731*
British Columbia Electric Railway, Vancouver, B. C.					
October, 1930........	1,248,830	782,058	....	466,772c	....
October, 1929........	1,230,278	845,983	....	384,295c	....
4 mo. end. Oct., 1930	4,846,038	3,138,730	....	1,707,308c	....
4 mo. end. Oct., 1929	.4,725,030	3,205,103	....	1,519,927c	....
Southern Canada Power Co., Sherbrooke, Que.					
November, 1930......	7,604	8,595a	....	*991*	....
November, 1929......	8,873	8,894a	....	78	....
12 mo. end. Nov., 1930	15,027	17,845a	....	*2,818*	....
12 mo. end. Nov., 1929	17,607	16,708a	....	898	....
Regina Municipal Railway, Regina, Sask.					
11 mo. end. Nov., 1930	361,290	253,641	....	....	*55,765*
11 mo. end. Nov., 1929	....	....	....	....	18,778
Mexico Tramways, Mexico City, Mex. (in pesos)					
November, 1930......	780,310	....	....	....	*97,060*
November, 1929......	839,528	....	....	....	*26,795*
11 mo. end. Nov., 1930	9,136,620	....	....	....	*796,940*
11 mo. end. Nov., 1929	9,845,675	....	....	....	*94,486*

Italic figures indicate deficit: *a* Includes taxes. *b* Net after rents. *c* Net before taxes. *d* After depreciation. *e* Including Brooklyn & Queens Transit System. *f* Amount by which full 5 per cent Manhattan dividend rental was not earned. *g* After joint account expenses and city's share of receipts but before charges.

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Announcing Car Stops with "Movies"

CATERING to the highly developed "movie" sense of its patrons on the Hollywood-Western Avenue line in Los Angeles, the Pacific Electric Railway has placed in service for trial an automatic announcer of car stops which flashes the name of the street upon a screen. The announcer registers the name of the street at hand from an ordinary motion picture film. The mechanism is entirely automatic, being geared to the car wheels so that when they are in motion the film moves proportionately. Gears and sprockets provide the mechanical connection.

As the car approaches the regular stop, the street name appears first at the lower part of the screen and slowly moves toward the top. At the top, an arrow points to the present location of the car. There are usually two street names on the screen at one time; the one at the top indicates the present location, and the lower the subsequent stop.

The entire mechanism and screen of the announcer are contained in a metal case, measuring approximately 30x30x8 in. Only one announcer has been used for the test, but it is the intention of the manufacturer to place a screen at each end of the car for each direction of traffic. The film is fastened to a belt and its length varies with the length of the route. The average length of film is approximately 3 ft. The announcer acts silently, and when placed against the ceiling of the car will not obstruct the free use of the passageway.

It is believed that, by showing the name in print, the announcer will be of particular service to tourists and others unfamiliar with the pronunciation of some of the street names. Another purpose for which it can serve is that of announcing the end of zones so that a passenger will know when to pay additional fare. Likewise, it can show at what point transfers should be made to another car. This will relieve the conductor of many troublesome details.

Compound Motors Tested

on Two French Systems

System developed by Mr. Lièvre, of Marseilles, using compound motors with series-parallel control and regeneration, shows savings of 30 per cent from similar equipments with series motors

REGENERATIVE control is attracting increased attention on the continent of Europe, and tests made in a number of cities have proved that material savings in electrical energy can be made by its use. The method of using compound motors permanently connected in series, which was worked out in Paris by L. Bacqueyrisse, was discussed in ELECTRIC RAILWAY JOURNAL for December, 1930.

At the same meeting of the Union Internationale de Tramways, de Chemins de Fer d'Intérêt Local et de Transports Publics Automobiles (International Tramway and Bus Association), at which the system mentioned above was demonstrated, the delegates were invited to inspect cars of the Versailles Tramways, also equipped with compound motors. The latter installation uses the system of regenerative control developed by Mr. Lièvre, rolling stock engineer of the Marseilles Tramways. It was the subject of a paper presented by him at the Algiers meeting of the French Railway and Automotive Transport Association in January, 1930, and reviewed in connection with the Paris meeting last October.

In Mr. Lièvre's system the equipment is quite similar to that developed by Mr. Bacqueyrisse in Paris. Compound motors are used for propulsion. The ones which have been employed so far are converted from the standard series motors, Types TH-523, TH-574 and TH-555, by replacing the series field coils by smaller series coils having fewer turns of wire, and shunt coils having many turns. The armatures have not been modified in any way, nor have the commutating coils.

The principal points of difference in the two systems are in the range of speeds obtained by shunt field control and in the motor connections used. The speed range with field weakening in Mr. Lièvre's system is not more than 1 to 3. However, by connecting the armatures successively in series and in parallel, in a manner similar to that used with plain series motors, the range of speeds that may be obtained with the equipments is 1 to 6, corresponding to speeds of 5 to 30 km. per hour (3 to 18 m.p.h.), the maximum speed remaining the same. The shunt fields are connected in parallel across the line, with a regulating resistance in the circuit.

Recovery of the kinetic energy between speeds of 30 and 6 km. per hour, representing about 96 per cent of the total stored energy, was considered quite sufficient within the speed limits of tramway service, so that the system was worked out on that basis. Since the minimum speed with the armatures connected in series without resistance is about 5 km. per hour, a single starting resistance is inserted, the resulting losses being very small. The transition from series to parallel is made by the bridging method, which is used in America on many large series motor equipments.

The controller differs considerably from the standard series-parallel controller. It has two principal parts, (1) the rheostatic connections for regulating the shunt fields and (2) the fingers and segments for starting, series and parallel running. There also are a reverser cylinder and switches for cutting out damaged motors.

The device for actuating the line breaker is special. The breaker is closed when the controller handle advances from the off position to point 1, and it remains closed for all other positions, no matter how the handle is turned. When the handle is turned back from point 2 to point 1, however, the line breaker opens in order to obtain dynamic braking on this point.

The controller has both a neutral position and an off position. In the neutral position all circuits are dead and the handle may be removed or the reverser thrown for the opposite direction. The off position makes the principal contacts, but they are inoperative until the controller handle is thrown to the first running point and the line breaker closes.

The reverser handle is similar to that used on ordinary controllers, interlocking with the main drum. When the reverser is thrown to forward or reverse the main drum handle can be rotated. In the first position the car starts with the motor armatures in series and with the starting resistance in circuit. The second position cuts out the resistance, leaving the motors in series across the line. Points 3 to 5 retain the series connection, the shunt field current being reduced in steps.

Between points 5 and 7 there is a transition from series to parallel armature connections by the bridging method, the transition resistances being interposed at maximum shunt field. Contrasted with the series equipment, the move from series to parallel may be made slowly, since the increase of shunt-field current reduces the armature current and there are no severe arcs to break. Position 7 places the armatures in parallel with maximum shunt field. Positions 8 to 13 provide acceleration by reduction of shunt field current.

The return movement of the controller handle increases the shunt field current and produces regenerative braking with no further attention from the operator. When the handle leaves position 2 for position 1 the line breaker opens and interlocks the braking relay, which closes the motor connections through a short-circuiting resistance. Therefore the car continues to slow down, but without further return of current to the line.

In order to facilitate the manipulation of the controller, the main drum carries only the segments for changing the shunt field current. The contacts for opening and closing the main circuit, and for short-circuiting the series resistance are made on secondary drums driven by means of cams so that the effort required is materially reduced.

The auxiliary parts, such as the line breakers and relays, do not present any special features. The use of a maximum voltage relay is to protect the equipment against high voltages which might be produced if the absorption of regenerated current in the line is impossible, as when the car or substation breakers have tripped, the trolley pole is off the wire, etc. It still is possible to brake the car without special attention on the part of the operator.

Tests have been made on a number of cars. The ones reported on by Mr. Lièvre were three single-truck cars with a wheelbase of 2.4 m. (7 ft. 10½ in.) weighing 11.5 metric tons (12.6 short tons). Comparisons were made with three similar cars equipped with the corresponding series motors. Although the maximum speed of the cars with compound motors is slightly less than that of the series motor cars, the schedule speed is greater for the compound motor equipments.

Several observations were made on the practical results of running with compound motors. The controller may be manipulated in either direction, without special precautions. The car speed may be reduced down to about 3 km. per hour (1.8 m.p.h.) without using the mechanical brakes, which are employed only to hold the car at a stop. The motorman gets the habit of running at a speed closely approximating that of any vehicle he may have to follow, giving flexibility in operation. For emergency stops regeneration usually is sufficient. Simultaneous action of regeneration and the mechanical brake is feasible although rarely necessary. During regeneration the voltage rise on the line is not noticeable unless the car is the only one running on the line. In the conduct of the tests the rise did not exceed 30 volts.

Tests were made on four different lines having varied characteristics, giving a wide range of conditions, including level track as well as steep grades and sharp curves. Both open and dense traffic sections were included. Tests were made with the motor car alone, and also when hauling one and two trailers. In every instance there was a reduction in specific consumption for the regenerative cars, the saving being from 10.5 to 35.7 per cent of the propulsion energy.

With no change in the armature windings, it was found that the motors used for regeneration showed an increase in temperature of 10 to 15 deg. C. greater than that of the series motors. This is due to the greater duty on account of carrying the regenerated current. The capacity of the motors was great enough that no difficulty was encountered, but a series motor working up to the heating limit could not be converted to a compound motor without incurring the risk of overheating. A compound motor specially constructed would be of somewhat larger dimensions and correspondingly heavier. It was estimated that the increase in weight would not be more than 20 to 25 per cent above that of the corresponding series motor. On the other hand, motors more closely fitted to the actual requirements of the routes on which the tests were made would have shown greater economy. This was indicated by the greater per cent of saving when hauling trailers. On one line the per cent of saving for the motor car alone, and for one and two trailers, amounted to 12.9, 23 and 25.4 per cent respectively. On another line the similar savings were 16.7, 25 and 33 per cent respectively.

In general it was the conclusion of Mr. Lièvre that the use of compound motors allows the construction of simple equipment effecting a worth-while saving of energy by a means entirely automatic and independent of the action of the motorman. Series motors of most types may be converted into compound motors at a nominal cost. The price of specially built compound motors and controllers should be only slightly in excess of series motors. The increase of weight is limited to the motor. The controllers should be no more cumbersome, while the addition of a line breaker and a voltage relay are compensated for by a reduction in weight of the resistors. The compound motor equipment has the same characteristics of simplicity and robustness, and it functions equally as well as the series motor equipment. The operation of the car is simpler and the starting is not jerky.

Apart from the regeneration of energy, the use of compound motor equipments is held to have the advantages of limited maximum speed, considerable reduction of wear on the brakeshoes and rigging, elimination of energy for the air pump and reduction in wheel wear. On the other hand, the wear of the gears is a little more rapid.

The Readers' FORUM

More Powerful Equipment Urgently Needed

Brooklyn, N. Y., Dec. 22, 1930.

To the Editor:

The writer wishes to congratulate your publication on several articles in the December, 1930, issue, including "More Power," by J. W. Welsh, on page 750; "Philadelphia Sample Car with High-Speed Motors and Magnetic Brakes," on page 741, and "Regenerative Equipment Planned for Paris Tramcars," on page 757. These and your editorial on page 730 headed "Making Faster Street Car Operation Practicable" are certainly timely, because, as you say, of the "need for equipment that will not block the streets."

The time is opportune for American urban electric railway operators to avail themselves of the detail electric motor and rail transportation developments of the past quarter century. Until the quite recent competition by the automotive transportation developments of the past decade, there has been no urgent demand on the part of railway operators or equipment manufacturers to apply available engineering knowledge to the problem of increasing speed with safety and thereby reduce operating costs.

In Mr. Welsh's article he proposes 2.5 m.p.h.p.s. smooth acceleration up to speeds at least three times those attainable with the usual street railway electrical equipment. This certainly can be most economically obtained by rewinding our present interpole motor equipments as outlined in the article on Paris tramcars.

However, it is in the retardation or braking of the average automobile, compared to the railway car, that the greatest superiority is evident. Sustained retardation of from 5 to 10 m.p.h.p.s. is usual with the automobile and emergency stops up to 20 m.p.h.p.s., at city street speeds. This is compared to the usual 1.5 to 3 m.p.h.p.s. of the railway car, because of the limit imposed by metal wheels on steel rails. The smoothness of such railway car stops is also aggravated by the truck spring reaction causing a jerk at the end of the stop.

It is suggested that, for economy as well as safety, the rate of retardation or braking should be 5 m.p.h.p.s. instead of the 2.5 m.p.h.p.s. of Mr. Welsh's article, with due consideration for standing passengers who are now thrown about by the truck reaction and instantaneous changes from acceleration to retardation and vice versa, of 5 to 10 m.p.h.p.s., by the average motorman.

Such higher sustained rates of retardation can be smoothly obtained by the method of regenerative control as outlined in the Paris tramcar article, in combination with a magnetic rail brake generally functioning as outlined in the article on the Philadelphia car. The magnetic brake should be "servo-operated" by the hand or foot-operated wheel brake gear with which the car would necessarily be equipped. There would be no necessity for the added cost and weight of other power brakes.

If it is thought simpler to drop the magnetic brake track frames to the rail by power means, the brake current itself can accomplish this, as disclosed in a patent granted to the writer on Nov. 29, 1910, No. 977,111, which is now expired and therefore free for use.

As single-end cars are now usual for simplicity and saving weight, cost, etc., and because of the reduction in main circuit contacts by the method of motor control outlined in the Paris tramcar article, a mechanically operated cam-type controller mounted underneath the platform could be effectively used. J. N. Mahoney.

Lièvre Regenerative Control Successful

Compagnie Générale Française de Tramways
Paris, France, Dec. 23, 1930.

To the Editor:

When reading the December issue of your review, we regretted to note that you did not mention the regenerative system of braking as applied in the Versailles tramways and inspected there by the delegates of the International Association on Oct. 23. Whereas in Paris the motors are permanently connected in series, the series-parallel control is applied to compound motors in Versailles. This system has been invented and patented by Mr. Lièvre, chief engineer of the Marseilles Tramways, before the first experiments in Paris. His rights, therefore, ought to be duly recognized.

It should be understood that the series-parallel control allows a wide range of speeds without weakening the field to such an extent as is necessary with motors permanently connected in series. The driving torque being the product of the strength of the field by the value of the current, the series-parallel connections lessen considerably the heating of the motors.

This system is specially fitted to routes which serve both crowded areas and residential districts, where a wide range of speeds is needed. Further, the emergency braking, as arranged by Mr. Lièvre, is exceedingly easy, being only actuated by the main handle without using the reverser as in Paris. Leon Boulle,
President of the Council of Administration.

Energy Checking Essential as Power Is Increased

Economy Electric Devices Company
Chicago, Ill., Jan. 3, 1931.

To the Editor:

Maybe we made a mistake. The recent article by J. W. Welsh, together with the current sentiment of various other operating officials, confirms our belief. When we introduced the Economy meter to the railway field those selling and operating checking devices were emphasizing "power saving" and "energy saving." We were all wrong. A lot of railway officials probably thought that energy saving was all there was to it—that our only object was to reduce the number of kilowatt-hours used. Some of them still do.

Nothing could be further from the truth. We are not a bit interested in how much energy is used legitimately. Use all the power the equipment can stand. Speed up service to the cracking point. Get bigger and better motors. Increase the energy consumption four or even six times.

But with every increase in energy demand the use of a man-checking device becomes more and more imperative. Energy costs become a larger and larger per cent of the total operating costs. The difference between good operation and poor operation represents a far greater amount of money saved or wasted, not only in energy but in proper handling or abuse of equipment and accidents.

No urban operator can hope to equal the 100 per cent schedule shown in Mr. Welsh's article. Under such a schedule, and only under such a schedule, can there be no differences in energy consumption due to good or poor operation. There can be no poor operation. Under the fastest urban schedules now operating there is a difference of 30 per cent in energy consumption between good operation and poor operation, and the man who is consistently near the bottom of the list is the one who holds back the faster schedules.

Under the fastest practical urban schedules which will be written for the newest equipment, there will still be a differential of approximately 20 per cent in energy consumption as between good and poor operation. The only way to eliminate that loss is through proper education and adequate follow-up of the individual men. This can be done only with the assistance of a checking device which covers every man, every day and every movement of a car. The intelligent use of such a checking device, which includes active follow-up based on the records produced, will always result in better operation with the attendant reduction in energy consumption and maintenance costs and closer maintenance of stiff schedules.

In conclusion, let me repeat that more power should be used through faster schedules and more powerful motors. But we must not forget that such conditions will call for tremendously increased opportunities for abuse of equipment and waste of energy through unchecked action of the men who handle the equipment.

As we said before, energy "saving" devices are not inconsistent with safer operation and faster schedule speeds. They are valuable tools for obtaining correct operation. What I want to emphasize is that the greater the energy called for by the service the greater is the value of any per cent saved. L. E. Gould.

Extensive Yearly Program of Track Reconstruction *Carried Out at Providence*

Renewals by the United Electric Railways for the past five years have amounted to approximately 25 per cent of the total track mileage. Construction of a new bridge has necessitated the relocation of one of the important routes. Large saving has been made in the distribution of new ties for replacements

By
H. R. SMART
Superintendent of Way and Structures
United Electric Railways
Providence, R. I.

DURING 1930 the United Electric Railways reconstructed a total of 10.25 miles of paved track in Providence and in the surrounding territory which it serves. Of this total, 8.56 miles were entirely rebuilt with new rails, and 1.69 miles were retied and rehabilitated. About 3½ miles of the old track which was torn up had been laid 30 years ago; the remainder was from 20 to 25 years old. Since 1921 all the pavement has been laid without cost to the company.

At present the total of main track operated by the United Electric Railways, exclusive of turnouts, sidings and carhouse tracks, is 191 miles. The track reconstructed during the last year, together with the total of reconstruction during the past five years, is 47.5 miles or approximately 25 per cent of the system mileage. During the same period 6.11 miles of track extensions have been made.

The streets in Providence and in the surrounding towns are generally quite narrow. Many of the streets in which there are double tracks are only 34 ft. between curbs; many of the streets with single tracks are only from 24 ft. to 30 ft. in width. The grades in Providence are generally easy, the maximum grade on which the railway operates being 8 per cent.

Our standard track construction in paved city streets calls for 7-in. 103-lb. girder rail, laid on 6-in. x 8-in. x 8-ft. treated ties with tie plates. Joints are usually thermit welded, except where track is renewed under traffic. For this type of work seam welding of tie plates has been adopted. Round tierods, ¾ in., are used every 12 ft. The type of ballast we use in our track construction depends upon soil conditions, either bank gravel or crushed stone being used. The city authorities have requested that we confine ourselves to these two types of ballast. Our standard specifications call for 6 in. of ballast under the ties. The finished pavement is usually

The use of a steam shovel in tearing up the old track has been found economical

Service is continued on one track while the other is under reconstruction

A new 120-ft. boulevard with a 30-ft. reserved strip for the railway has been opened to the heavy traffic crossing the bridge

A double track, 10 ft. on centers, has been laid across the 60 ft. wide bridge

3-in. sheet asphalt laid on a 6-in. concrete base.

The laws of the state provide for the paving of streets from curb to curb, including the area occupied by the car tracks, by the city, without any cost to the railway. The United Electric Railways, however, maintains the pavement between the rails and 18 in. outside of each outer rail. In the construction of tracks and the paving of streets, close co-operation with the city authorities is mutually advantageous. If the railway desires to renew its tracks on a street which the city is not planning to pave, the cost of the new pavement must be borne by us.

Steam Shovel Used to Tear Up Track

Before renewing a double track in a paved street, portable crossovers are laid down from 900 to 1,000 ft. apart. Construction work is begun on one track only and carried to completion before work is begun on the other track. In this way service can be maintained on one track. The old tracks are cut into 32-ft. sections, the rails being burned with an acetylene torch. The entire section, rails, ties and pavement, are pulled up with a steam shovel. A crane car working on the undisturbed track during the interval between passage of passenger cars picks up the old rails. Granite blocks and ties are loaded upon trucks and usually sold on the job. After the trench is excavated by steam shovels, it is rolled by a 12-ton road roller. The treated ties, which have been previously distributed along the sidewalk, are laid in the trench on 2-ft. centers. New rails are hauled to the job by crane cars and distributed as desired. Usually the rails are hauled in late at night when there is no car traffic. We have adopted the Bethlehem Steel rails 103-287A. Rails are then spiked and the joints welded by the thermit process. All tamping is done by mechanical air tampers. Just before the concrete paving base is laid, all ties are retamped to insure a very firm base. The track is then ready for the paving base which is laid by the city contractor.

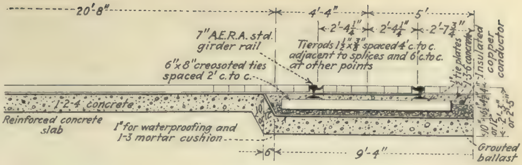
Many of the double track lines operate along narrow streets. This is Eddy Street, 34 ft. between curbs, where track was relaid in 1930

We have been successful in using steam shovels to tear up the old tracks; we feel that a large saving has been realized by this practice. With the use of steam shovels we have been able to remove as much as 1,000 ft. of track in a nine-hour day. This was accomplished with a crew of nine men, consisting of one engineer, one fireman, two acetylene cutters and five laborers.

The welding of joints, as previously mentioned, is practically all made with the thermit process. We have used thermit joints since 1920 and we have had practically no failures. In 1929 we installed 1,032 joints and in 1930 the number was 1,037. Our method of installing these thermit joints is as follows: Two trackmen working as part of the welding crew bolt the fishplates on to the joints with two bolts on either side of the joint. The rails are separated by $\frac{3}{8}$ in. at the joints by temporary insertions of a tie plate. At the same time one member of the welding crew makes molds and two other men raise joints, line them, remove tie plates and install inserts. After this preliminary work has been completed, the molds are placed on the rails, the preheaters are fired and the crucibles are set. Two crucibles and six mold boxes, three on each rail, are used continuously. Following the pouring, two men dismantle the joints, cut off surplus thermit material and clean off the grooves. The joints are then ground by two men with Atlas grinders. The grinding of the joints is finished at night with a reciprocating grinding car. The number of joints installed in a nine-hour day varies from 18 to 22.

The track and building work of the United Electric Railways is designed and supervised by H. W. Sanborn, chief engineer. The construction work is carried out by W. A. Taylor, general foreman.

An unusual degree of co-operation between the many agencies involved has made it possible to carry out a plan of tie distribution, by which ties are delivered to points on the job from the boat. Previously, the ties had been delivered to the storeyards and required additional handling by us to distribute along the points of construction. The price of the ties remains the same, whether delivered to the job or to our storeyards. In 1930 the purchasing department bought 19,000 Southern treated pine ties. One lot of 13,000 was delivered to Providence by boat and distributed directly to the different construction jobs which were planned for the season. Unnecessary handling of the ties before construction work was thus eliminated. This saved the cost of handling and transporting of ties from our storeyards. It has been estimated that from 8 to 10 cents per tie was saved by this method.


20'-8"
4'-4"
5'
2'-4¼"
2'-4¼"
2'-7¾"
7" A.E.R.A. std. girder rail
Tierods 1½"x⅜" spaced 4' c. to c. adjacent to splices and 6' c. to c. at other points
6"x8" creosoted ties spaced 2' c. to c.
½" tie plates
1-3-6 concrete
Insulated copper conductor
1-2-4 concrete
Reinforced concrete slab
1" for waterproofing and 1-3 mortar cushion
10" or 12"
2'-3" or 2'-5"
6"
9'-4"
Grouted ballast

Typical cross-section of track structure for arch spans and over piers of new bridge

New Concrete Bridge Across Seekonk River

The largest single job carried out in 1930 was the relocation and renewal of track made necessary by the building of a new bridge over the Seekonk River, joining the city of Providence and the town of East Providence. The track work on the bridge itself and that on the approaches from Providence and East Providence were completed last summer. Altogether, more than 18,000 ft. of track was involved in this project. The total expenditure by the United Electric Railways was $150,000, including the cost of shifting cables and feeders. This new Washington Bridge was built to provide increased traffic capacity between Providence and East Providence. The old steel bridge had only three traffic lanes, and conditions had reached the point where it could not accommodate the steadily increasing traffic crossing the Seekonk River. Moreover, because of the low clearance of the bridge frequent openings of the draws were necessary in order to permit many small craft to pass through. This was the cause of frequent delays to the heavy traffic across the bridge. The new bridge has a much higher clearance and thus permits the passage of most of the river craft without raising the lift.

The bridge is an imposing structure of the bascule type, being flanked by six concrete arches on either side and having long concrete approaches at the ends. To reduce the time of opening to a minimum the bascule lifts are electrically operated. Double tracks were laid along the center of the bridge, spaced 10 ft. on centers. The distance between curb and outer rail is 22 ft. 7¾ in., permitting a roadway for two lanes of traffic.

The cost of the bridge was apportioned between the city of Providence, the town of East Providence and the state of Rhode Island. An additional sum of $500,000 was spent by the city of Providence to build and beautify the new boulevard approach to the bridge. This boulevard is 2,400 ft. long and 120 ft. wide, and has two 30-ft. sheet asphalt paved driveways with 10-ft. sidewalks, and a 30-ft. parkway in the center. It is planned to beautify the parkway with grass, shrubs and trees. The eastbound track of the line operating over the bridge runs through the center of this parkway. The westbound track runs along Wickenden Street to the north of the boulevard, branching off at East Street at the foot of the bridge approach, and again joining the eastbound track at Transit Street.

On the East Providence side of the bridge, a new street has been laid out for a distance of 600 ft. connecting with Warren Avenue, which formerly led to the old bridge. Taunton Avenue and the new street constitute the two East Providence approaches. The town of East Providence has spent $60,000 to improve the pavement of the streets which will bear the heavy bridge traffic.

Regular Service Maintained During Construction of Bridge

An interesting phase of the work connected with the construction of the new Washington Bridge was the method adopted to maintain uninterrupted car service. The total length of route involved in the relocation and renewal of track was about 1½ miles. As the construction of the bridge and highway progressed, temporary tracks and portable crossovers were installed and relocated from time to time. Judicious planning and close cooperation with the construction work on the bridge made it possible to carry out the track work simultaneously with the building of the bridge. In this way the time between the completion of the bridge and the completion of the track work was reduced to a minimum. On the day the new bridge was officially opened, the change from the old to the new railway route was accomplished in fifteen minutes. The first vehicle over the new bridge was an electric car operated by a veteran employee, James Downes, who ran the first car over the old Washington Bridge some 30 years ago.

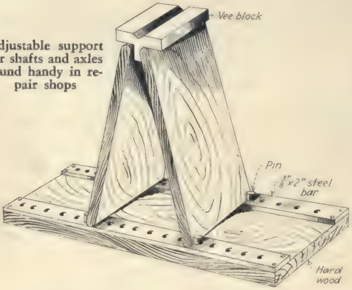
Relocation of 1½ route-miles of double track was carried out by the United Electric Railways without cessation of service during the construction of the new Washington Bridge connecting Providence and East Providence

Adjustable Work Support

By Charles H. Willey
Superintendent Hoyts Electric Works

RUGGED work supports, as shown in the illustration, have been found convenient as temporary rests for much of the material that undergoes repair in our garage and shops. They are simple in construction, and can easily be made in any shop.

A good-quality hard wood plank forms the base of the support. Two flat steel bars, which can be cut from ordinary 2 x ⅜-in. stock, are fastened to the sides. The bars are drilled at desired spacings for the insertion of pins. Four of these pins support two lengths of plank which come together at the top to hold a "V" block, as shown. The block can be adjustable for various heights by varying the distance between the two sets of pins. The block can be used for the support of axles and shafts. Two of these devices can be used to support an armature. When not in use, the supports can be dismantled to occupy very little space.



Adjustable support for shafts and axles found handy in repair shops

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Greasing Trolley Wire Reduces Wear

SEVERAL years ago greasing of trolley wire was begun by the Milwaukee Electric Railway & Light Company as a means to reduce the severe wear that had been experienced. This wear was found to be due to the use of two types of current collectors—shoes on interurban cars and on three-truck trains in city service, and trolley wheels on all other cars. It was observed that, due to slight arcing, the wheels produced small projections on the wire, which were scraped off in flakes when the shoes followed. In the summer of 1928 the wheels were eliminated altogether.

At about the same time it was learned that trolley wires were being greased in Fort Worth, Tex. After an investigation it was decided to adopt this practice experimentally. The methods first used for greasing were rather crude, but it was indicated satisfactorily that the life of trolley wire would be materially increased.

The lubricant consisted of grease and graphite, which causes the wires to take a high polish. The graphite adheres to the sides of the wire for about six weeks.

An interesting and unexpected result of this practice was the total elimination of radio interference, which previously had caused many complaints. If the intervals between greasings exceed approximately six weeks radio fans will begin to complain about interference.

After it was clearly demonstrated that greasing or polishing of the trolley wire was desirable, means were developed for doing it economically. A line car was equipped with a pressure-operated grease container which supplies grease through proper connections to a special shoe riding on the trolley wire ahead of the regular trolley pole. Two men operate the equipment; one runs the car at about 25 m.p.h., and the other rides on top to watch the greasing shoe and control the air valve which regulates the amount of grease supplied to the trolley wire. Satisfactory results will be obtained with grease of the proper body for the existing temperature.

The greasing costs about 50 cents per mile for city lines and 55 cents per mile for interurban lines, making the total annual cost on the system approximately $2,000. The savings due to longer life of wire are estimated to be three or four times this figure, and, in addition, radio interference complaints are greatly reduced.

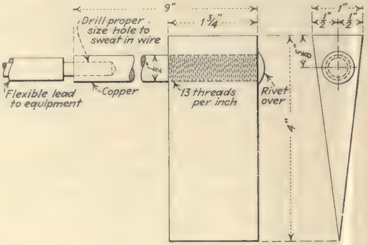
◆

Bond Welder Ground Lets Cars Pass*

By H. A. Brown
Switch and Signal Division Cleveland Railway

CONSIDERABLE time and trouble are saved the rail bonding division of the Cleveland Railway by a non-interfering rail connection for grounding welding equipment used for bonding rail joints in paved streets. This connector is readily attached anywhere along the track.

The device consists of a wedge of cold-rolled steel, 4 in. long and 1¾ in. wide, tapering to a point from a thickness of 1 in. At a point ⅝ in. from the base of the wedge a tapped hole is drilled for a ½-in. thread. Into this is placed a ½-in. threaded copper rod, which is riveted over to hold it firmly in the wedge. The other end is drilled to form a terminal in which is sweated the negative lead from the bonding equipment.


9"
Drill proper size hole to sweat in wire
1¾"
1"
½"
½"
⅝"
½"
Flexible lead to equipment
Copper
13 threads per inch
Rivet over
4"

This steel wedge makes an efficient ground for welding devices and obviates removal every time a car passes over the track

The connector is attached to the track by driving it between the rail and the pavement with a hammer. On open track it may be driven between the rail and the end of the splice bar. When attached it allows uninterrupted passage of the car wheels, preventing the delays which are experienced when the welder must remove the grounding device and replace it every time a car passes.

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*Submitted in Electric Railway Journal *Prize Contest.*

Turning Down Armature Shafts to Undersize Diameters

By E. F. Whitney
Renewal Parts Engineering Department
Westinghouse Electric & Manufacturing Company

MANY electric railways follow the practice of turning down worn or scored armature shaft journals to the nearest undersize diameter for which renewal bearings are available. This practice is effective in obtaining longer life from replacement armature bearings. Usually at the time of overhauling a motor, the armature journals are calipered. If the shaft is found to be worn tapered as much as 0.01 in. on the diameter, or if the journal is uneven or scored, the armature should be placed in a lathe and a cut taken to true up the journal surface. When there are a considerable number of motors on a property which use the same type armature bearings, it is possible to machine the shafts to an undersize journal diameter in steps of 1/32 in. If, however, the number of motors does not justify sizes varying by 1/32 in., the sizes to which the journals are to be turned down can be held to steps of 1/16 in.

Classification of Undersize Armature Bearings

Nominal Bore of Armature Bearing, Diameter, Inclusive	Clearance Before Assembly in Housing	Clearance After Assembly in Housing
2 in. to 3 in.	Plus 0.006 to plus 0.008	Plus 0.006
3 in. to 4 in.	Plus 0.008 to plus 0.010	Plus 0.007
4 in. to 5 in.	Plus 0.012 to plus 0.014	Plus 0.008
5 in. to 6 in.	Plus 0.016 to plus 0.018	Plus 0.009

With a suitable standard of undersize journals established, renewal armature bearings, finished bored for each undersize journal size, should be stocked. In many instances standard bearings can be rebabbitted and bored out for the first 1/32 in. undersize step. For the remaining undersize steps renewal bearings should be obtained from the manufacturer finished bored undersize as desired. Such bearings will be found to have a 1/16-in. babbitt lining, which is sufficient to keep the armature from striking the poles if the bearing should become hot and melt out the babbitt. In such an emergency the bronze shell will form a temporary bearing to support the armature, thus avoiding excessive damage to the armature core and field pole pieces.

The general practice when replacing armature bearings is to use either rebabbitted bearings or obtain new bearings finished bored with clearances as given in the table so that after the bearing is pressed into the housing the contraction of the finish bore will not be so much as to cause excessive binding on the shaft. With some armature bearings, after assembly in the housing, there will be a slight distortion of the bore in the vicinity of the waste window. If this distortion reduces the bearing clearance below the minimum limits given in the table, then the bearing as assembled in the housing should be broached or scraped sufficiently to relieve the binding.

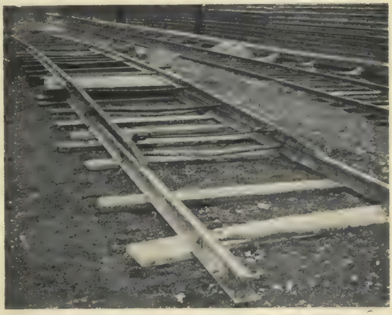
In general, armature shafts are not worn more than ⅛ in. undersize, unless the motors have had unusually hard service. Should this occur, however, it probably would be better to replace the shaft so as to avoid the breakage, which might occur if the journals were turned down to ¼ in. undersize or smaller.

The practice of boring each bearing to suit its shaft is not reliable, as the desired bearing clearance can rarely be obtained unless each shaft is trued up. Standardization of undersize journals for finished bored undersize armature bearings will result in an increase of life of bearings and reduce the expense of replacements.

Expansion Joint for Temporary Track*

By C. B. Bennett
Way Department Cleveland Railway

DURING the track construction season in Cleveland, daily variations in temperature of 30 deg. or more frequently occur. These changes are troublesome to the way department on account of the expansion and contraction of the temporary track placed alongside a track to be reconstructed and used either for operating or construction purposes. Assuming a stretch of 2,000 ft., exclusive of the turn-outs from the main track, variations have been found of 4⅝ in. in the length of the rails of the temporary track between 4 a.m., when the temperature was 60 deg., and 4 p.m., when the temperature rose to 90 deg. F. There is also the possibility that the temporary track may creep in the direction of car movement. To overcome these difficulties the Cleveland Railway, with plank and ties, has built up one end of a section near the center of the total stretch, to a height where it may be placed on top of the adjoining section. All of the side track is placed on 1-in. plank and the overlapping end, usually about 10 ft., has planks on the lower rails to provide a full bearing for the base of the upper rails. The run-offs are 16½ ft. long and have shoes every 2½ ft., fitting into the gage side of the under rail. Both track and run-offs have tie rods and pipe spacers every 6 ft.


Section of temporary track raised above adjoining section to provide expansion joint

Maintenance Contest

First period of Maintenance Contest closed Jan. 31. Awards of prizes will be announced soon.

Entries will now be received for prizes of second period, which ends April 30.

Copies of rules are available upon request.

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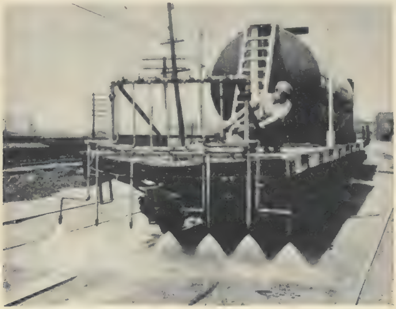
* Submitted in Electric Railway Journal *Prize Contest.*

Weed Extermination

By Claude Timblin
Engineer of Maintenance Penn-Ohio System

MUCH trouble has been experienced by the growth of weeds along portions of the tracks of the Penn-Ohio System. Beside making the right-of-way unsightly, weeds cause ties to decay, prevent proper drainage through the roadbed, and when crushed on the rail head reduce the adhesion between rail and wheels, which renders the control of cars difficult, particularly on grades. We have been able at a low cost to reduce weed growth greatly and to exterminate weeds entirely in some locations by means of a shop-constructed exterminator.


Spray nozzles are arranged at the end of a flat car to treat effectively a 10-ft. strip of the right-of-way

A 6,800-gal. tank, 24 ft. long and 7 ft. in diameter, made of ¼-in. sheet steel, was placed upon one end of an ordinary flat car. It was laid on 8 x 10-in. timbers cut to fit the tank and fastened by iron straps and turnbuckles. A 3-in. pipe line runs to the front of the car where it is connected to seven 1¾-in. spray lines, 16 in. above the rail. Spraco brass nozzles are attached to the ends of the spray lines. These nozzles will spray a 10-ft. width effectively. It was necessary to place a Sarco strainer trap in the 3-in. line to prevent clogging of the piping system. A centrifugal pump with a capacity of 130 gal. per minute also was installed in the 3-in. line. A Crane quick-acting gate valve is placed in each spray line. An extra spray is connected with a rubber hose to treat areas that are at a distance from the track. Two 4-ft. water glasses are placed one above the other at the ends of the tank to indicate its content. An agitation pipe placed inside the tank stirs the chemical, which is purchased in crystal form, so that it is not allowed to settle before it is dissolved.

At a speed of 15 m.p.h., about 400 gal. per mile is used along a 10-ft. strip. Flexible hose connections in the line between the tank and the sprayers prevent the stripping of threads caused by car movement. A valve is placed at the tank to cut off the supply if the pipe line breaks.

Many weeds will wilt after the first treatment and will not grow again. Among these are milkweed, chickweed and creeping Charlie. Such weeds as horsetail, wild clover and wire grass are difficult to kill and sometimes require two treatments. The work is most effective during dry weather. If a hard rain follows a treatment, many weeds sprout again and continue to grow. Continued treatment for two or three years will almost entirely eliminate weed growth.

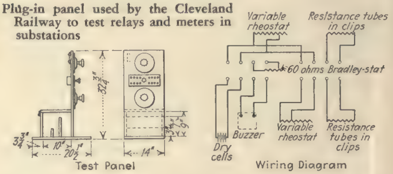
◆

Portable Test Panel*

By William J. Hankey
Assistant to Superintendent of Power Conversion
Cleveland Railway

TO SIMPLIFY the testing of equipment in automatic and manual substations of the Cleveland Railway, a portable test panel was designed. The panel is equipped with four dry cells, a six-volt buzzer and two variable rheostats, known as Westinghouse field rheostats, 2,200 ohms each, having 35 steps so connected that a series or parallel circuit can be made. A compartment built at the rear of the panel holds the testing equipment, and affords support for the entire set-up. The wiring of each part of the circuit is terminated at a plug-in panel, thus saving considerable time in arranging various test circuits required for this type of work, and simplifying the change from one test circuit to another. Test circuits can be easily formed for calibrating various types of relays, coils and meters by the use of the necessary indicating meters, a phantom load box and a testing transformer. The buzzer circuit checks the contacts of relays on test before making accurate meter readings.

Plug-in panel used by the Cleveland Railway to test relays and meters in substations



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Two-Way Operation on Single Track Carried On With Automatic Signals

By P. J. O'Neill, Jr.
Railway Engineer, Community Traction Company

DURING the progress of a grade-crossing elimination project, cars of the Community Traction Company were operating over a temporary track. The space was insufficient for a double-track detour, so that the operating problem created was that of providing a reliable signal system to avoid single track meets.

The job in question was located on Central Avenue, Toledo, Ohio, at the New York Central railroad crossing where grade separation plans called for a lowering of the street level immediately adjacent to the plant of the Willys-Overland Company. As this plant provides a large part of our industrial rush-hour traffic, it was necessary to install a temporary detour around the job so that uninterrupted service might be given to and from this factory. Because of the rush-hour headways at this

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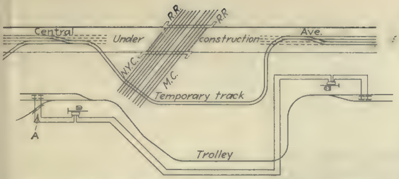
*Submitted in Electric Railway Journal *Prize Contest.*



A large saving was realized in the installation of a Nachod automatic signal system by the Community Traction Company on a temporary single track

point, manual signals would have been out of the question unless a man was stationed to operate the signals. Over the period of the work it was estimated that the labor cost for operating manual signals would have amounted to approximately $1,800.

As we had a spare set of Nachod signal blocks on hand it was decided to install this automatic system which, with its car-counting feature, was more desirable than a manual system. The net cost of this installation over the period of the job was approximately $125. The signals functioned perfectly during the ten months that it was necessary to use them.

The illustration indicates the general layout and shows the signal circuit diagram. The only way in which this circuit differed from a standard installation is in the two additional contactors installed at *"A,"* which were used to include cars operating from a special loading track at one of the industrial plants in the block system.

◆

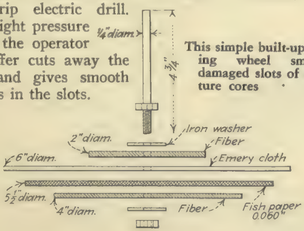
Buffer Refinishes Armature Cores*

By Farrell Tipton

Electrician San Diego Electric Railway

WHEN preparing an armature core for rewinding it usually is found that the laminations have been damaged, leaving sharp edges and corners on the slots. Often when grounds or short circuits have occurred hard spots have been burned into the steel which are exceedingly difficult to smooth out. A simple buffing wheel is used in the armature shop on the San Diego Electric Railway to refinish the slots quickly.

Emery cloth which has been given two coats of shellac to produce a firm body is cut in 6-in. circles and backed up with 5½-in. circles of 0.060 fish paper for additional firmness. Fiber washers are placed on each side of these disks and the assembly is completed on a -in. threaded shaft with iron washer and a nut, as shown in the illustration. The buffer is chucked in a pistol-grip electric drill. With slight pressure toward the operator the buffer cuts away the burrs and gives smooth surfaces in the slots.



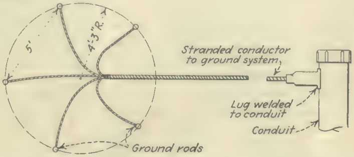
This simple built-up buffing wheel smooths damaged slots of armature cores

Grounded Conduit Reduces Interference With Communication Circuit

By R. C. Thayer

Telephone Engineer, Great Northern Railway

INDUCTANCE interference caused by operation of electric locomotives in the 8-mile Cascade Tunnel of the Great Northern Railway was reduced by carrying the tunnel communication cable through iron conduits. The cable is a standard lead-sheath paper-insulated telephone cable of high dielectric strength, and is carried in a standard 3-in. galvanized rigid iron conduit. Cast-iron pull boxes were inserted flush in the tunnel wall at 600-ft. intervals to permit the cable to be pulled. At these points the splices between the various sections were made, so that the cable is continuous for the entire length of the tunnel.

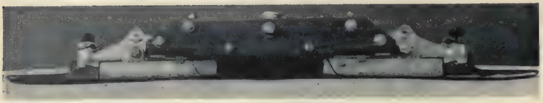


Substantial reduction of inductive interference results when conduit is effectively grounded by means of stranded cable and driven rods

The shielding effect of the conduit is due partly to the magnetic shielding from the iron, and partly to the skin effect in the conduit; in order to obtain the benefit from the latter it is necessary to preserve the electrical continuity of the conduit and also have it effectively grounded. The standard conduit couplings have sufficiently low resistance to obviate additional bonding between the sections. Bond wires were, however, welded from the conduit entering on one side of the pull box to the conduit on the other side.

At the ends of the tunnel the conduit turns upward at a point approximately 150 ft. from each portal and comes to the surface. At these points it was impossible to obtain an adequate ground because the earth was of comparatively shallow depth over, and somewhat pocketed by, the granite formation through which the tunnel was drilled. A stranded copper conductor, No. 0000 size, was welded to the conduit and laid in a trench approximately 1½ ft. deep, extending at right angles to the track for a distance of 200 ft. at one end of the tunnel and 350 ft. at the other. Here ground connections could be obtained in earth kept moist by small streams. At these points five copperweld ground rods, 1 in. x 9 ft., were driven, spaced equally around the circumference of a circle 8½ ft. in diameter. The strands of the conductor were then divided into five parts, one part being connected to each ground rod. The effective resistance of the multiple group of rods themselves measures 0.25 ohm. The stranded conductor also assists materially in obtaining a satisfactory ground, although its effectiveness varies widely with the amount of moisture in surrounding soil. Measurements indicate that the voltage induced in the communication circuit is 27 per cent less in the tunnel than in sections of open lines at which the communication circuit is spaced from the tracks at an average distance of 1,000 ft.

NEW PRODUCTS
for the Railways' Use



Section insulator with new rubber insulating runner developed by Westinghouse

Rubber Runner for Section Insulator

WITH the purpose of still further reducing the number of insulating runner replacements on railway overhead, the Westinghouse Electric & Manufacturing Company has placed on the market a section insulator, which is said to incorporate the first commercial use in this country of a solid rubber insulating runner to railway section insulators. The runner has an arcing tip molded on each end to prevent the arc from burning the rubber when the trolley wheel passes through the section insulator with the power on.

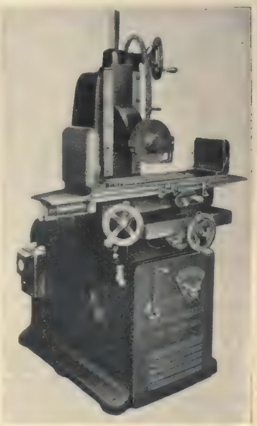
It is claimed that the rubber runner has longer life, it will not splinter or warp, and it is unaffected by atmospheric conditions. Dewirements are reduced, as the cushion effect of the rubber prevents the trolley wheel from digging into the runner, thus causing an uneven underrun. Service tests have indicated that the rubber runner will wear more than twice as long as any other type.

◆

Surface Grinder Equipped With Hydraulic Drive

LARGE-SIZE surface grinders, equipped with hydraulic feed for longitudinal movement of table and cross feed, have been placed on the market by the Gallmeyer & Livingston Company, Grand Rapids, Mich. The grinder is designated as the No. 2 size, having a working surface of table 6x18 in., and an unusually heavy casting for a base. This base houses the motor, the hydraulic pump with its oil control valve, and the oil tank with its supply of oil for the hydraulic operation.

The table has a range of speed from 0 to 60 ft. per minute with variations obtainable by moving the control lever on the front of the base. The cross feed can be made to operate at either end of the stroke or at both ends, with a possible variation in feed from 0.01 in. to 0.125 in. When the automatic hydraulic feed is in use the hand wheel and pinion for hand operation of the table are entirely disengaged to insure a smooth hydraulic drive. If hand operation is desired, the piston rod connection to the table is disconnected, and movement is transmitted through a spiral pinion. The table is started and stopped by the crank handle on the base.



Machine arranged for wet grinding with the front and rear table splash guards removed to show working surface

The grinder carries a standard-size wheel of 8 in. diameter with ½-in. face, but the spindle is sufficiently large and rigid to allow for variation from the standard. It has a capacity for grinding work up to 9½ in. thick under the standard 8-in. wheel. The machine can be furnished for dry grinding or with a dust collecting system as an extra.

Push Button to Supersede Rope Control of Small Floor Cranes

Push-button control of small floor cranes permits operation by one man

ONE man can operate small cranes with the pendant-type push-button contral designed by the General Electric Company to supersede the present rope or chain type. Advantages claimed are greater safety to the operator, saving in the time of one man and less aisle space required.

The push-button station is 20¼ in. long, 2⅜ in. wide and 2$\frac{9}{16}$ in. deep. It can be readily grasped and operated by one hand. The cast aluminum box makes it both light and durable.

Continuous Wheel Rim Facilitates Tire Removal

CHANGES in wheel rim construction for the purpose of facilitating tire removal have been made by the Firestone Steel Products Company in its Type R wheel rim recently placed in production. The rim is made to fit the standard 28 deg. mounting. Interchangeability on the same wheels with other types of Firestone rims is offered as an advantage to the fleet operator who is standardizing rim equipment.

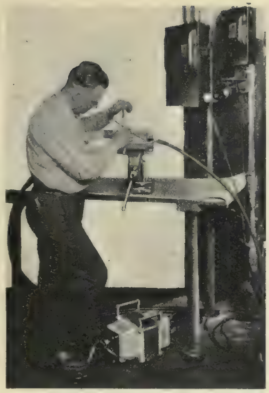
The rim is in one piece, and is claimed to be durable, solid and secure. The locking ring is easily removed with a tire tool or a screw driver. No part of the rim or side ring is split, assuring a positive tire seat.

Improved Firestone rim is made to fit the standard 28 deg. mounting

The Type R rim is a continuous base rim with one side flange integral with the base and one continuous removal side rim. The new type of locking rim is riveted at one end to the removable side flange. The lock ring is always visible to the operator when changing tires and is easily removed with a screw driver. The rim is made in 7-in., 8-in., 9-in. and 10-in. sizes; in 20-in., 22-in. and 24-in. diameters, and is recommended for heavy-duty service.

Electric Brazing Equipment

RESISTANCE to the flow of current offered by carbon blocks generates the necessary heat in a new electric brazing device announced by the General Electric Company. As the carbon blocks have a high resistance, the large amount of heat generated makes it possible to complete the joint by putting small pressure upon it.



Convenient electric brazing equipment which utilizes the resistance properties of carbon blocks to generate heat

The equipment consists of a transformer, foot switch and tongs for holding the carbon blocks and work. The sizes of the various parts depend on the size of work being handled and the joints that are to be made.

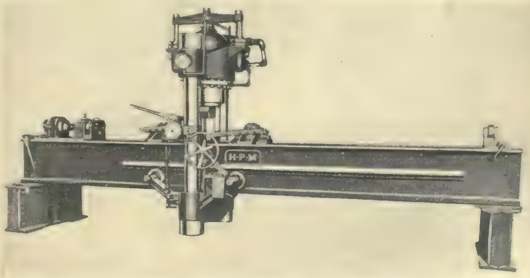
A typical equipment includes a 5-kva. transformer weighing 45 lb., and having a 220-volt primary and an 8-volt secondary. A 10-kva. transformer for heavier duty, weighing 95 lb., has the same primary taps and has 8, 10 and 12-volt taps on the secondary. The secondary taps can be readily changed for different sizes of joints; the higher taps being used for larger sections.

The parts to be brazed are either designed with flat surfaces to begin with, or are flattened before brazing. After the work is clamped in the tongs, a flux is added, and the current is turned on by pressing the foot switch. When the flux melts, the brazing alloy is held against the hot metal until it melts and flows into the joint by capillary attraction. During the process of brazing, the hot alloy dissolves a thin film of the metal surfaces, thus forming a new alloy which is rich in copper and which has a higher melting point than the original alloy.

Heavy-Duty Hydraulic Press with Precision Control

DESIGNED for heavy duty and precision control, a number of new hydraulic presses have been announced by the Hydraulic Press Manufacturing Company, Gilead, Ohio. They are particularly adapted for such service as straightening shafts, axles, bars, rods, etc. The presses are equipped with H-T-M precision manual control for governing both the direction and speed of press ram travel. Control is accomplished through a single conveniently located hand lever. In order to facilitate the handling of long or heavy work which could not be conveniently moved back and forth under the ram, the pressure unit is so arranged that it can be moved along the bed supporting the work.

Maximum working pressure is automatically regulated and adjustable over a wide range up to the maximum press rating. Six standard sizes of straightening presses are available. The first four have pressure capacities of 75, 100, 150 and 200 tons, respectively. The other two, designed for heavy duty, have pressure capacities of 300 and 400 tons.

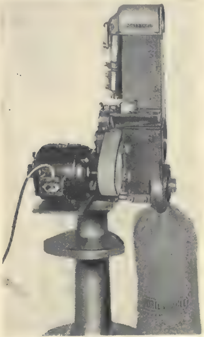


Heavy-duty press with movable ram which facilitates the handling of unwieldy material

Vertical and Horizontal Belt Sander

FOR the shop where low first cost and portability are desired in motor-driven machinery, a belt sander, designated as type B-9, has been designed by the Porter-Cable Machine Company, Syracuse, N. Y. Removing burrs, cleaning up castings, grinding bearing caps, replacing light milling, sharpening tools and polishing are among the metal working uses for which this machine is suited.

An even and true finish is possible in the grinding operation by having a flat metal bed placed under the belt to serve as a firm backing and to preserve straight lines and sharp edges. Either a.c. or d.c. motors can be used as desired. Type B-9 has a two-speed arrangement so that proper surfacing speed for wood or metal may be obtained. Speed is quickly changed by simply lifting the motor and placing the belt into the proper grooves in motor and drum pulleys, with the motor weight acting as an automatic take-up on the V belt. Another feature of the machine is a vacuum dust-collecting system which is built right into the machine. In the lower dust chute is placed a suction fan, driven by a small V belt from a drum pulley. The dust is carried through this chute into a bag or conveyed elsewhere by merely attaching a flexible pipe. It is claimed that this high vacuum also prevents excessive clogging of the belt, assures faster finishing of work, and increases the life of the belt.


Belt sander, equipped with a 1-hp. motor and dust collecting bag, is suitable for a variety of metal working uses

Changing abrasive belts on this machine is quickly accomplished without removing the guard or idler pulley. Belt tension is controlled by a spring in the steel post which acts on the idler pulley and automatically takes up the belt stress. This tension is released by tightening the knob at the end of the post. Tracking of the belt is controlled by one thumb screw which tightens the idler pulley. There is also an automatic belt guide which prevents the belt from running wild into the side of the machine.

The sanding or grinding bed can be adjusted to give the correct surface tension to the belt, and to allow the use of a felt cover for flexibility; or the bed may be removed entirely for slack belt sanding. If the bed becomes worn at the table end, it can be reversed, thus bringing the opposite end into use. Compound angles can be quickly secured by a tilting table which is graduated 45 deg. up and down. This machine is equipped throughout with dust-proof precision ball bearings which are lubricated through Alemite Zerk fittings.

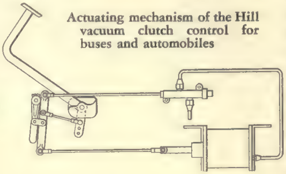
◆

Vacuum Clutch Makes Manipulation Easier

MUCH of the effort involved in the manipulation of the bus clutch, becoming severer with larger engines, can be lessened with the use of a vacuum control which is patented and distributed by the Hill Engineering Corporation, Richmond, Va. This control employs the suction from the intake manifold.

A button on the gear-shift lever ball controls the valve which allows the suction completely to disengage the clutch. After the shift is completed, the button is released and the clutch takes hold automatically. Release of the button permits a swift return of the clutch pedal until it is automatically checked just before engagement. A check valve slows down this movement and allows a smooth, steady start of the vehicle in first gear. In traffic, if the operator wishes to remain in gear for a quick start, he shifts to the desired gear, and holds his thumb down on the button until ready to start. By holding the button down the car is allowed to coast.

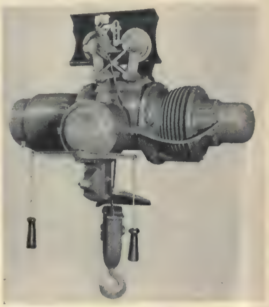
In installing the actuating mechanism of the control no replacement of any motor parts nor change in the design of the car is necessary.


Actuating mechanism of the Hill vacuum clutch control for buses and automobiles

◆

Compact Hoist

VARYING requirements of speed or capacity can be met with the hoist manufactured by the Shepard-Niles Crane & Hoist Corporation, Montour Falls, N. Y. Because of the interchangeability of parts different motor and gear end sections can be attached to the same body piece. To meet further the requirements of hoisting service the motors are especially designed and rated on the basis of 50 deg. C. temperature rise for 30 minutes.


Many interesting improvements have been incorporated into this trolley hoist

Sufficient radiation area is obtained by means of cooling fins which are cast integral with the gear end section inclosure. All moving parts in the gear end are in an oil bath, providing automatic and positive lubrication. The hoist is also featured by heat-treated steel gears, improved electric brake and limit switch. The load block is fully inclosed, except on the close clearance type of hoist. The ball-bearing trolley wheels offer ease of operation along the runway beam for the push type trolley. The planetary gearing of the hoist is said to produce a balanced drive and to maintain positive alignment. By various combinations of standard units, unusual service conditions can be met without the cost of special designs.

NEWS *of the Industry*

LATE NEWS

Aurora, Ill.—The Chicago, Aurora & Elgin Railroad has announced the sale of 20 and 30-ride tickets between Chicago and Aurora. The former sells for $15.20 and the latter for $20.60. They are good in both directions, to and from all Chicago stations. Free transfer to the Chicago Rapid Transit trains in Chicago is included.

◆

Huntsville, Ala.—Feb. 15 has been set by the Alabama Power Company as the probable date for the operation of buses here in substitution for street cars. Permission for the change was granted by the Alabama Public Service Commission after the City Council and residents had reached an agreement. Buses will operate over substantially the same routes as the street cars.

◆

Boston, Mass.—Trustees of the Eastern Massachusetts Street Railway have passed the quarterly dividend of $1.50 a share on first preferred and sinking fund stocks which would ordinarily be paid Feb. 15 to stock of record Jan. 31.

◆

Chicago, Ill.—Holders of securities issued by the elevated and the surface lines here have an additional 44 days in which to deposit their securities with the protective committees. Halsey, Stuart & Company, managers of the consolidation plan, have so announced. On Dec. 1 security holders were given until Jan. 15 to deposit their holdings. This has now been extended to Feb. 28. It is expected the merger plan will be declared effective some time before Feb. 28.

◆

Madison, Wis.—S. B. Way, president of the Milwaukee Electric Railway & Light Company, and Bernard J. Fallon, vice-president of the Chicago, North Shore & Milwaukee Railroad, were among the railroad executives who accepted the invitation of Phillip F. La Follette, governor-elect of Wisconsin, to confer with him on Dec. 23 prior to his taking office on Jan. 1, on the problems confronting the railways of the state. Phillip F. La Follette is a son of the late Senator Robert F. La Follette, long a critic of the railroads.

◆

Albany, N. Y.—Governor Roosevelt on Jan. 27 sent to the Senate for confirmation the nomination of Milo R. Maltbie, New York City, as a member and chairman of the state division of the Public Service Commission.

◆

Springfield, Ill.—Bus line payments of gasoline tax, license fees and weight tax in 1930 exceeded $900,000, representing one-fourth of the amount expended annually for maintenance, patrol and policing of Illinois highways. The 75 operators holding licenses transported 105,428,770 passengers. Steam and electric railways own nineteen of the lines, and 56 are operated independently.

(Late News Continued on Page 106)

Freight Prominent Subject on C.E.R.A. Program

Problems of large and small railway properties discussed. Lively interest shown in trolley bus operations.

ANALYSIS of freight service in all its phases featured the program of the Central Electric Railway Association at its annual meeting held at the Hotel Claypool, Indianapolis, Ind., on Jan. 29 and 30. The entire Thursday morning session was devoted to this subject, in which the needs of the shipper, store-door service and current trends were studied. The meeting was one of the best ever held by the association. The sessions were well attended and the interest displayed in the discussion was keen.

In the absence of President L. G. Tighe, L. M. Brown, superintendent of transportation Indiana Railroad System, presided. The president's address was presented by Myles Lambert, who supplemented the president's assertion that the basis of transportation for all communities is very sound. Mr. Lambert pointed out that the railways had used the depression period as a time for reconstruction and would reap the benefits of stability in the near future. Gaining public approval and confidence has made great strides. Co-ordination of services through mergers is a significant movement making for sounder operation and security of finances.

Labert St. Clair, of the American Electric Railway Association, followed with additional optimistic views. He suggested that dead transportation lines be discarded to strengthen the good ones.

H. B. McNeely, traffic commissioner Indianapolis Chamber of Commerce, discussed the advantages which freight haulage by truck held over the present method used by electric railways. He stated that trucks and buses are here to stay and that, to meet competition, the railways must modify their present regulations, such as the closing hours of freight houses, crating requirements, packing rules, carload minimum weights, mixed carload rules and methods for settlement of freight charges.

T. J. Day, freight traffic manager Pacific Electric Railway, Los Angeles, spoke at length on pick-up and store-door delivery

(Continued on Page 108)

Coming Meetings

Feb. 5—New England Street Railway Club, Copley Plaza Hotel, Boston, Mass.

Feb. 26-27—Central Electric Railway Accountants Association, Oliver Hotel, South Bend, Ind.

March 10-12—Oklahoma Utilities Association, Oklahoma City.

March 12-13—Annual Convention, Illinois Electric Railway Association, Springfield, Ill.

April 8-9—Central Electric Railway Master Mechanics Association, Hotel Secor, Toledo, Ohio.

April 16-18—Annual State Convention, Missouri Association of Public Utilities, Excelsior, Mo.

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 26-Oct. 2—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Subway Agitation in Milwaukee

Either elevated or subway transportation from downtown Milwaukee to the northwest side is sought in a bill to be introduced in the Legislature by the Jefferson Club, which provides for establishment of a commission to study the project. The committee recommends a north and south rapid transit line between Twelfth Street and 27th Street to connect with the private right-of-way of the Sheboygan line at North Nineteenth Street and Atkinson Avenue and running south from the latter point on either elevated or subway lines. At the south, it suggested that the line connect with both the rapid transit lines of the Milwaukee Electric Railway & Light Company and the North Shore line.

De Luxe Coaches Between Fall River and Boston

Beginning Jan. 31, the Eastern Massachusetts Street Railway was scheduled to open a de luxe coach service between Fall River and the Ashmont station of the Boston Elevated Railway, to be known as the "Golden Arrow." The opening service calls for six trips a day (Monday-Friday) from Fall River via Taunton and Brockton to Boston. Eight trips will be run on Sundays and still more on Saturdays. The one-way fare from Fall River to Ashmont station will be $1.25; round-trip, $2.25, with children from five to twelve years of age at half fare. The running time will be two hours. The new route was obtained despite steam railroad opposition, as the company pointed out that it simply wished to supplement its present trolley territory with a faster service.

LATE NEWS

(Continued from Page 105)

Milwaukee, Wis. — Right-of-way for the new interurban line being built from Racine to Kenosha by the Milwaukee Electric Railway & Light Company will be entirely on private roadbed from the outskirts of Racine to the center of Kenosha. Grading the new line between Racine and Kenosha has been completed, and it is expected that next spring ballasting will be done and the rails laid. The completion of this final unit will put the M.R.K. line on private right-of-way from downtown Kenosha to the outskirts of Milwaukee, with the exception of a portion of the line within the city of Racine.

◆

Portsmouth, Va.—The City Council has adopted two ordinances amending the transportation franchise held by the Virginia Power & Electric Company to permit the substitution of buses for cars on the Park View system over a slightly different route. The ordinance calls for the removal of all rails and overhead. The company agrees to pay to the city $33,000 to be relieved of its obligation to repave within the space occupied by the rails.

◆

North Adams, Mass.—The Berkshire Street Railway is planning to equalize bus fare between Cheshire and Pittsfield, and Pittsfield to North Adams. The readjustment is likely to result in increased rates.

◆

Milwaukee, Wis. — A petition of 300 Milwaukee residents that the Fond du Lac Avenue bus line of the Milwaukee Electric Railway & Light Company be extended to 60th Street, a distance of more than half a mile, has been granted by the Railroad Commission. The service has started.

◆

Indianapolis, Ind.—The Indianapolis Street Railway has withdrawn its objection to an independent bus line operating between Butler University and two city high schools on the north side of the city after a series of hearings before the Board of Public Works. Attorneys for the railway withdrew objections when representatives of the Logan J. Smith Bus Line, Inc., showed that the service was being given under contract and was operated only on school days and during school hours. For several years the Smith Company operated two bus routes serving West Indianapolis and the south side of the city.

◆

Michigan City, Ind.—Abandonment of local railway service and substitution of a city-wide bus system is proposed by the Northern Indiana Railways, Inc., in a plan recently presented to the City Council by George R. Green, vice-president. The change would involve an investment of $75,000 in new buses, a garage and other equipment.

◆

Washington, D. C.—The Public Utilities Commission probably will consider 3¾ cents as a maximum street car and bus fare for school children, under the terms of the bill pending in Congress. Vice-Chairman Harleigh H. Hartman, legal authority of the body, so intimated on the eve of a public hearing called in anticipation of passage of the measure. Most of the evidence is expected to be presented by the Washington Railway & Electric Company, the Capital Traction Company, the Washington Rapid Transit Company and by other bus lines of the District.

◆

Hamilton, Ont.—Subject to the right to terminate the option up to March 15, the Ontario Hydro-Electric Power Commission has advanced an option to Stanley Johnson to purchase all of the capital stock of the Hamilton Street Railway until May 1 at a price of $4,000,000. It is said that the decision to reserve the right to terminate the option to March 15 was made in order that the city may have an opportunity of acquiring the property. Since the termination of negotiations with the city as indicated by resolution of the City of Hamilton, to acquire the Hamilton Street Railway the commission has been negotiating with private concerns for the sale of same.

◆

What Makes a Business

IT IS very clear, I think, that the conception of the functions of a president or chairman of a major corporation have changed materially in recent years. Not so long ago the chairman's seat was filled either by the controlling owner himself, or by a man selected by the majority owner and, in either case, the owner gave orders.

In a great number of our large corporations today the directing head has lost the dictatorial attributes implied in the popular phrase "captain of industry," and he is—what? I think he is a *trustee.*

No, I do not say that all men similarly placed conceive their jobs as trusteeships, or at any rate that they have worked it out thoroughly in their minds on that basis. Men who have not a legal background may not have translated the problem just this way: many have not put it into words at all, but an analysis of the function of directing a large corporation as nearly all are constituted today reveals the elements of trusteeship. The owner-manager, having a large cash interest, is the most likely to be swayed by supposed expediency, and decide for that course which seems likely to bring the most immediate gains.

Am I hired to look solely after the interest of capital? If I were to do so, using the methods which were used in earlier generations, that would be a very sure way of doing harm to the interests of capital. No, the interplay of forces and the need for delicate proportion and balance which develop with the great growth in size and the mechanization of industrial units demand that I represent not merely "capital" but owners, employees and customers alike, in the relationship of a trustee. And this, I think, is a step in the right direction.

—Owen D. Young *in Colliers.*

Indianapolis, Ind.—Representatives of nearly 25 steam and electric railroads operating in Indiana met with members of the Public Service Commission on Jan. 21 to consider possible advantages of reducing freight rates to pre-war levels. The commissioners suggested that a reduction of 50 per cent in present rates would result in thousands of dollars in savings to shippers and might regain for the railroads much of the short haul freight business they have lost to trucking concerns. Many of the railroad representatives, however, expressed doubt that the traffic could be recovered, even with reductions in rates, unless the roads established store door delivery service on a large scale. This would be unprofitable unless a large increase in business resulted. The carriers are considering the matter.

◆

La Crosse, Wis. — The Mississippi Valley Public Service Company has asked the Wisconsin Railroad Commission for authority to discontinue operation of certain electric railway lines here. In its decision the commission ruled that it had no power to authorize such discontinuation, but that the city granting the original franchise had jurisdiction.

◆

High Point, N. C.—The North Carolina Public Service Company is said to contemplate the substitution of service by bus for railway service here.

◆

Baltimore, Md.—Suggestion that the company operate a car line in the central section of the city at a 5-cent fare has been made to the United Railways & Electric Company, by the National Housewives, Inc. The organization contends that a loop in the downtown section would be popular and profitable.

◆

Atlanta, Ga.—A petition of Atlanta citizens asking that the Georgia Power Company be required to resume service on the West Peachtree railway line has been dismissed by the Georgia Public Service Commission. The railway reported that it has increased service on the Buckhead - Oglethorpe lines to take care of patrons on West Peachtree Street.

◆

Boston, Mass.—The State Department of Public Utilities reports that there are 97 bus lines operating in the state under certificates granted by the department, an increase of five over the previous year. According to the department, earnings of the bus lines have been seriously affected by loss of patronage due to the use of automobiles and to the general industrial depression.

◆

Peoria, Ill. — Trolley buses will be placed in operation here as a unit of the local transportation system by the Peoria Division of the Illinois Power & Light Corporation. The trolley buses will be operated over a 2¼-mile route making a loop and tying in with a downtown terminus of the street car lines.

◆

Danville, Va.—The Danville Traction & Power Company failed to pay $10,000 interest due on Jan. 1 on $400,000 outstanding in bonds. The bonds are due to pay 2½ per cent semi-annually on Jan. and July 1. The principle becomes due in 1941. Under the terms of the indenture by which the bonds are secured the company is entitled to a 90-day period of grace in meeting the interest obligation.

N.A.M.B.O. to Meet This Year at Atlantic City

Bus operators accept invitation to hold 1931 convention parallel with A.E.R.A. sessions. Other important business transacted by association committees

SEVERAL important meetings of committees of the American Electric Railway Association and the Engineering Association were held at Indianapolis in connection with the C.E.R.A. convention on Jan. 29 and 30. The principal session was that of the executive committee of the American Association, held Jan. 30. At this meeting, on the recommendation of the policy committee, action on the question of an exhibit in connection with the 1932 convention was deferred.

Announcement was made that the invitation extended to the National Association of Motor Bus Operators to hold their 1931 convention in Atlantic City during the week of the A.E.R.A. convention, Sept. 26-Oct. 2, had been formally accepted. The two associations will co-operate in scheduling meetings in order to avoid conflicts as far as possible. It is expected that arrangements will be made so that delegates of the bus association will have the opportunity to visit the A.E.R.A. exhibits. These will include a display of modern buses and accessories.

Reports were made by various committee chairmen, indicating substantial progress on numerous important current assignments.

Following a meeting of the program committee of the Engineering Association, the engineering executive committee met on Jan. 29. Reports of progress from all divisional chairmen were received. The tentative program adopted by the program committee was considered.

Receiver Appointed for W. B. & A. Railroad

Judge Morris A. Soper signed an order n the United States District Court on Jan. 27 appointing George Weems Wiliams receiver of the Washington, Baltimore & Annapolis Railroad. The order was signed upon a petition filed by R. E. Duvall Company, Inc., creditor in the amount of $3,246. The Cleveland Trust Company, also an alleged creditor, was granted leave to intervene as a party plaintiff.

Substitution Program in Vicksburg

At the regular semi-annual meeting of he Mayor and the Aldermen of Vicksburg, Miss., negotiations were concluded which have been pending for some time between the Mayor and Aldermen and he Mississippi Power & Light Company in regard to paving of the oadway out Drummond Street, between he car tracks, the discontinuance of the street cars on the Q. & C. route out Cherry and Drummond Streets to All Saints' College, out Farmer Street to the city cemetery, the institution of a bus service to be operated on these lines, and the removal of the tracks on both roads. The changes are to be effective by June 1.

The bus line will cover the route now traversed by the cars, both to All Saints' College and out to the city cemetery. The buses will be operated on a fifteen-minute schedule from the Drummond Street terminus to Openwood and Farmer Streets, with a continuance of the present 30-minute schedule from between this street intersection to the city cemetery.

Tracks on Drummond are to be removed and this part of the street paved, and brought up to the same grade as the present street paving. This work to be done by the Mississippi Power & Light Company at a cost of $6,520.

Under the same agreement the tracks of the Mississippi Power & Light Company in the unpaved part of the city cemetery road will be removed and the company will pay into the city treasury $2,720 to cover the cost of paving this portion of the street.

The railway system out Clay and out Washington Streets will be continued as at present.

More Customers Through Better Maintenance

Improving equipment and bettering maintenance were topics which occupied the major portion of the meeting of the Electric Railway Association of Equipment Men, Southern Properties, held in Chattanooga, Tenn., on Jan. 28, 29 and 30, but spirited discussion developed on the present status of the industry and ways of building up patronage. It was the general opinion that better service, accompanied by intelligent advertising, would induce riding.

In his opening address, President A. Taurman, superintendent of equipment Birmingham Electric Company, sounded the keynote by saying: "The public today is looking for economy more than ever before. New cars, new track and faster schedules are always desirable, but what we need now is more customers, and this thought should take first place in our minds today."

Following addresses of welcome papers were read on Baltimore's new cars, trolley buses, increasing speed, equipment improvements, steel for car construction, bus maintenance, car cleaning, painting and prevention of frozen air. The second day was devoted to discussion of questions submitted in the association's questionnaire. On the completion of business on the third day properties of the Tennessee Electric Power Company were inspected.

A. T. Clark, superintendent rolling stock and shops United Railways & Electric Company, of Baltimore, described in detail the 150 new cars recently placed in service by his company. He dealt particularly with the new features, including rapid acceleration, high free-running speed and rapid rate of braking.

Accompanying his presentation with an interesting sound movie of modern trolley bus installations, Guy W. Wilson, General Electric Company, discussed the vehicle from an operating standpoint.

After describing the method of shunting the motor field to obtain higher speeds on his property, E. J. Jonas, superintendent of equipment Cincinnati Street Railway, presented a survey of what other companies have done to increase speeds. He also discussed the W-N drive with high-speed motors, magnetic track brakes and the problem of new versus revamped cars.

G. M. Woods, Westinghouse Electric & Manufacturing Company, cited the many recent developments in equipment, among them the worm drive.

"Recent Developments in Sheet Steel for Car Construction" was the subject of a paper by H. M. Arrick, assistant manager railroad division, American Rolling Mill Company. Mr. Arrick related the development of higher grade sheets and listed their advantages, including time, labor and material savings during the finishing of the car, improved appearance and longer life.

R. A. Hauer, vice-president and manager bus department of Mack-International Motor Truck Corporation, presented a detailed program for a thorough inspection of buses. He also discussed keeping of individual bus records, hiring of capable drivers, approval of drivers by the maintenance department, safety and preventive maintenance.

In his paper on "Car Cleaning," H. L. Turney, master mechanic Birmingham Electric Company, told of favorable impression on the public of clean, warm and well-ventilated cars. He summarized data received from 26 member companies on cleaning costs and methods.

J. T. Porter, superintendent of equipment at Richmond, developed in his paper the subjects of color durability, quality of materials, the paint shop, organization, job preparation and application and care of tools and materials.

What's in *News of the Industry*

Merchandising lively C.E.R.A. topic.

Business improves slowly.

Bus men to meet with A.E.R.A. at Atlantic City.

Receiver for Baltimore-Washington road.

Fifty-four bus routes approved in New York City.

Franchises in Calumet district revived.

Detroit Municipal retrenching.

Report against tramways by Royal Commission.

Owen D. Young sees officers as "trustees."

Racine-Kenosha line on private right-of-way.

Trolley buses for Peoria, Ill.

Substitution suggested in Michigan City.

More customers through better maintenance.

New Loop Line in Vancouver

Work is going ahead on several additions to street railway track of the British Columbia Electric Railway. A new loop has been completed on Joyce Road off the Kingsway arterial highway at a cost of $10,000. The loop facilitates street car service at this point since the track has been laid on private property enabling cars to make the turn completely off the main road. Formerly the street cars spent the "lay over" on Kingsway.

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C.E.R.A. Meeting

(Continued from Page 105)

carried on by his company. He gave details of its organization as an express company, the actual conduct of operations, contracts with connecting railroads and with local trucking companies. His paper created so much interest that a special meeting was called following the afternoon session to discuss the subject.

Frank Gerlach, assistant to the president Electric Railways Freight Company, showed how freight was being handled direct from consignor to consignee by means of the "Railwagon," a vehicle developed by the Electric Railways Freight Company and the Lake Shore Electric Railway. He described in detail the method of operation with railwagons and flat cars between Cleveland and Toledo.

Thursday afternoon's session was devoted to the study of problems on large and small railway properties and trolley bus operations. Walter A. Draper, president Cincinnati Street Railway, presented a paper on large city operations. Another paper by F. L. Butler, vice-president and manager of railways Georgia Power Company, was read by Arch Robison, vice-president and general manager Western Ohio Railway & Power Corporation. It presented the problems confronting the small city operators. Mr. Draper said that all large cities faced the one problem of how to expand facilities and serve expanding communities without a corresponding increase in the number of passengers. He discussed city control as adopted in Cincinnati, service at cost and various methods of subsidy. Regardless of method the advantages of co-ordinated control of all forms of transportation in a city, such as car, bus and taxicab were pointed out.

Mr. Robison, speaking for Mr. Butler, emphasized the necessity of merchandising as a solution of the problems for small cities. More intimate contact is possible with city officials and the public than in large cities, he said. Through the study of the problems, improvements should be made, then there should be proper pricing and selling of the railway's products to the public. Bus substitution cannot be ignored. As to the procedure to be followed, he referred to the report of the A.E.R.A. committee on small-city operation.

Walter Becker, automotive engineer Chicago Surface Lines, discussed trolley buses and their use in Chicago. He pointed out how the development of the gas bus, especially of street car design, had paved the way for the modern trolley bus. He gave general specifications for equipment and overhead on the Chicago system. Mr. Becker stated that the vehicles are maintained by the regular street car forces, who are easily trained to care for the additional features. Furthermore, the operators were selected from members of the train forces with a knowledge of motor vehicle operation.

The Business Outlook

IMPROVEMENT is painfully slow. This is disappointing to those looking for miracles, without understanding how they are produced; but in the longer view the absence this year of a swift rebound from the December bottom is encouraging in a left-handed way. The rise in steel activity is slowing down; but merchandise carloadings suggest increasing movement of finished goods; building contracts and power production continue to resist further decline; only money turnover, has dropped a bit, and the latter has its favorable side, indicating greater public confidence in the banks. The deflationists are now dominant in every aspect of public and private policy. Under existing conditions improvement depends solely upon increase of consumer replacement demand. It is bound to be slow.

—*The Business Week.*

The annual dinner and dance were held Thursday evening. Charles W. Chase, president Gary Railways, Gary, Ind., speaking at the dinner outlined the problems before the industry, and suggested as a remedy the service-at-cost franchise to secure friendly co-operation of the city, to obtain capital, to regulate competition and to guarantee a fair return for the service required. He urged the railways to modernize, merchandise and investigate the new vehicles, such as the trolley buses.

On Friday morning the association was addressed by J. H. Hanna, president of the American Electric Railway Association. Mr. Hanna made three points: First, passenger transportation to cities is essential; second, conditions now are generally unsatisfactory; third, improvement is dependent on securing new capital. To accomplish the latter, franchises must be modernized to secure continued operation. Relief from paving and other taxes must be included. The industry is in a sound condition and will develop stability.

Following Mr. Hanna's address, reports of committees were heard and following officers were elected for the ensuing year.

President, George R. Green, vice-president and general manager Northern Indiana Railway.

First vice-president, A. Blunk, general manager Lake Shore Electric Railway.

Second vice-president, L. M. Zapp, general manager Eastern Michigan Railways.

Executive committee, J. H. McClure, vice-president and general manager Cincinnati & Lake Erie Railroad; Arch Robison, vice-president and general manager Western Ohio Railway & Power Corporation; Henry Bucher, vice-president Indiana Railroad System; R. W. Emerson, general manager Cleveland Railway; Joseph Donahey, Cleveland Frog & Crossing Company; R. N. Graham, vice-president Northern Ohio Interurban Company; Charles H. Jones, general manager Chicago, South Shore & South Bend Railroad; James H. Drew, Ohio Brass Company; T. A. Fernding, president of the Dayton-Xenia Railway.

Conspectus of Indexes for February, 1931

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by
ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Jan., 1931 7.77	Dec., 1930 7.77	Jan., 1930 7.67	Oct., 1930 7.79	Jan., 1926 7.32
Electric Railway Materials* 1913 = 100	Jan., 1931 126	Dec., 1930 128	Jan., 1930 144	Dec., 1926 159	Jan., 1931 126
Electric Railway Wages* 1913 = 100	Jan., 1931 231.9	Dec., 1930 231.8	Jan., 1930 231.3	Jan., 1931 231.9	Jan., 1926 223.8
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Jan., 1931 189	Dec., 1930 192	Jan., 1930 205	Nov., 1928 206	Jan., 1931 189
General Construction Cost Eng'g News-Record 1913 = 100	Jan., 1931 194.5	Dec., 1930 196.9	Jan., 1930 209.0	Jan., 1927 211.5	Jan., 1931 194.5
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Dec., 1930 78.4	Nov., 1930 80.4	Dec., 1929 94.2	Jan., 1926 103.6	Dec., 1930 78.4
Wholesale Commodities Bradstreet 1913 = 9.21	Jan., 1931 9.51	Dec., 1930 9.84	Jan., 1930 11.68	Jan., 1926 14.01	Jan., 1931 9.51
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Dec., 1930 137.2	Nov., 1930 141.4	Dec., 1929 158.0	Dec., 1925 165.5	Dec., 1930 137.2
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Nov., 1930 150.0	Oct., 1930 151.9	Nov., 1929 163.0	Nov., 1925 171.8	Nov., 1930 150.0
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Dec., 1930 99.1	Nov., 1930 105.4	Dec., 1929 116.4	Feb., 1929 140.4	Dec., 1930 99.1
Bank Clearings Outside N. Y. City 1926 = 100	Dec., 1930 81.1	Nov., 1930 76.1	Dec., 1929 98.6	Oct., 1929 111.8	Nov., 1930 76.1
Business Failures Number Liabilities, Millions of Dollars	Dec., 1930 2495 405.11	Nov., 1930 2000 280.51	Dec., 1929 1827 67.38	Dec., 1930 2495 405.11	Sept., 1928 1348 23.13

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

British Body Reports Unfavorably on Tramways

Storm of Adverse Comment Follows Royal Commission's Recommendations—Members Without Practical Experience in Transport—Commission's Adherents Comment Cautiously

NONE of the recommendations contained in the third and final report of the British Royal Commission on Transport, made early in January, has provoked greater interest or more adverse comment than the commission's suggestions about the tramways. That is easy to understand since it was the view of the commission that tramways are in a state of obsolescence and cause much unnecessary congestion and unnecessary danger to the public. Briefly, the commission recommended that no additional tramways should be constructed, and that, though no definite time limit can be laid down, they should gradually be replaced by other forms of transport. According to the commission there are many towns in Great Britain where trams are definitely not necessary, and a start should be made in these places with their replacement by trolley buses or omnibuses. These are among the high points of that part of the report.

The scope of inquiry was so large that in some respects the proposals of the commission are rather vague. The subject of road transport by buses was dealt with in a previous report by the commission, and legislative effect has already been given to some of those proposals.

The commissioners give the main-line railway companies much advice as to ways of improving their services—matters on which the heads of the railway companies are probably better informed than the commission. A point of interest here is railway electrification. The commissioners say that in view of the fact that a departmental committee is at present engaged in examining the whole subject of the electrification of railways, they have refrained from taking evidence and giving detailed consideration to it. They believe, however, that it would be greatly to the interests of the railways, and at the same time tend to the convenience of the public, if all suburban services were electrified in every district where there is intensive suburban passenger traffic.

In dealing with the subject of tramways, the commission says, as indicated previously, that its considered view is that tramways, if not an obsolete form of transport, are at all events in a state of obsolescence, and cause much unnecessary congestion and considerable unnecessary danger to the public. They recommend, therefore, (a) that no additional tramways should be constructed, and (b) that, though no definite time limit can be laid down, they should gradually disappear and give place to other forms of transport.

The commission is informed that, at the present time, trams are necessary in certain large towns if the traffic is to be carried with any degree of expedition. The royal body is not prepared to dispute this, but the members maintain that there are, on the other hand, many other towns where trams are definitely not necessary. They feel that a start should be made in these latter places towards the ultimate abolition of tramways and the substitution therefor of trolley buses or omnibuses.

They are unable to prescribe any definite period for the extinction of tramways, but are of the opinion that it will be to the advantage of the inhabitants of the towns where they exist to get rid of them by degrees. The substitution of trolley buses may ultimately prove to be the best solution in certain cases (or at all events it may form an economical transition from the tramcar to the motor-omnibus).

In connection with privately owned trolley bus undertakings, which are subject to purchase by the local authority at intervals of less than 21 years, they recommend that in the future, the next date upon which the option to purchase becomes exercisable should be 21 years after the expiration of the current period.

The obligations relating to road maintenance from which tramway undertakings seek relief appear to constitute a heavy burden on the operators. The commissioners say, however, that it must not be overlooked that the license duty on a tramcar amounts to only 15s. per annum, whereas a bus or trolley bus is taxed according to its seating capacity, and may pay as much as £96, which is the amount of the tax on a 56-64-seater vehicle on pneumatic tires. They are not prepared to recommend that tramway operators should be relieved of the obligation to maintain the road which was placed upon them, by the Tramways Act, 1870.

Pacific & Atlantic Photo

100 Double-deck super-Pullmans building for London. Old and new in striking contrast

The correspondent of Electric Railway Journal, resident in London, points out that few of the proposals of the commission could be carried out without legislation and that the matters of railway electrification and tramway abolition are quite beyond any general legislation. Moreover, it is interesting to note that, at a time when the principal tramway authorities in Great Britain are spending huge sums in acquiring new and improved tramcars, a suggestion like that of the Royal Commission for abolition of tramways should be put forward. Some at least of the commissioners are evidently obsessed by buses.

To supplement the comment of its own correspondent, Electric Railway Journal cabled to London for an expression of opinion from A. M. Willcox of the *Tramway and Railway World;* a reply by cable was as follows:

> Members of the Royal Commission on Transport with one or two exceptions have no practical acquaintance with tramway operation. They are motorists, who as a class, object to the presence of rails in the streets, and ignore the fact that modernized tramways continue to be the most efficient and economical means of transport where large numbers of passengers have to be carried. In its two previous reports the commission has made valuable recommendations regarding motor traffic, many of which have been included in recent legislation. The reference to tramways in the third and final report represents, however, the personal opinion of the commissioners and their advice is not to be regarded as having received official sanction.
>
> No legislation is at all likely to follow their report, which is generally regarded as an interesting but highly controversial discussion of various phrases of the transport problem. The fact that $483,000,000 is invested in tramways in Great Britain and that large numbers of new and up-to-date cars have been and are now being constructed, indicates unmistakably that those best able to judge are of the opinion that for a generation at least street railways will remain an essential feature of urban transport.

Further comment on the commission's findings is contained in the English trade papers dealing with transport that have just come to hand. Among other things, *Tramway and Railway World* says:

> The companies (main line railroads) have been urged for decades to make use of electric traction, and it may be hoped that the suggestions of the commission will infuse a little more enterprise in the boards of the raiway companies.
>
> The proposal gradually to abolish tramways and the assertion that tramcars constitute "most grievous obstructions to all other forms of transport" cannot be substantiated. If members of the commission were frequent users of London tramways they would realize that they promote rather than hinder the flow of traffic.
>
> Hundreds of tramcars have been improved for greater comfort of passengers. Hundreds of cars cannot be built for nothing, and those who indulge in the expenditure expect reasonable returns. The latest developmnts in luxurious tramcars are, of

(*Continued on Page* 110)

$2,500,000 Project Revived

The service-at-cost franchise, sought in Hammond, East Chicago and Whiting, Ind., by the Calumet Railways, Inc., has been voluntarily revived by the Hammond City Council at the urgent request of Mayor Schonert. The franchise was rejected by the Hammond Council several months ago, although favored by Mayor Schonert and many other leading citizens and civic organizations.

The Calumet Railways, Inc., proposes to spend at least $2,500,000 in rehabilitating transportation service in Hammond, East Chicago and Whiting, three adjoining communities in the Calumet region. The proposed expenditure of this amount of money and the consequent employment of many men now unemployed played a leading part in the Hammond Council's reconsideration of the franchise. It was referred to the committee on streets, alleys and franchises for recommendation.

The service-at-cost franchise submitted by the Calumet Railways, Inc., provides that it must be accepted in identical form by the three communities concerned. When the Hammond Council rejected the proposal, its consideration in the other two cities was indefinitely postponed.

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Agreement Delayed in Springfield, Ohio

Efforts of the City Commission, the citizens' transportation committee and representatives of the Cincinnati & Lake Erie Railroad to agree on a franchise term for city transportation in Springfield, Ohio, proved fruitless at a conference of the three groups on Jan. 26. A detailed plan proposed by the railroad for taking over the Springfield railway lines and starting a combination street car, trolley bus or gasoline bus service was considered. The main objections to the proposal centered on the service-at-cost, the 20-year grant, and the use of trolley buses by the company. Hopes had been held out that definite action could be taken to solve the transit problem, which is holding up paving work in many sections of the city. Just what the next step will be appears to be doubtful. Railway officials said they were not certain what the city wanted, while city officials said that the proposal as submitted by the company apparently was unsatisfactory in many ways.

◆

Trolley Bus Opposed on Woodward Avenue

The Detroit Street Railway Commission has abolished 68 jobs in the Department of Street Railways with an estimated saving of $204,000 a year. The changes, made in an effort to secure operating economies, were announced by the commission following a meeting in the office of Mayor Murphy. A request was forwarded to the City Council asking for aid in the drawing, submission and adoption of charter amendments and other necessary legislation designed to aid the department's financial position. Men removed by the abolition of positions, a list of which is to be completed in a few days, will be given preference in re-employment.

The commission has asked that the city pay the D.S.R. for all land purchased by the department and then charge the department rental for it; also that the cost of track relocations made necessary by street widenings be assessed against the widenings; and that only such extra cost of street paving and maintenance as is actually caused by operation of street cars be assessed against the municipal railway. That the bus mileage tax be waved is also asked.

The recommendations were made in a report following four weeks' study by the commission and by the members of the departmental staff, and were incorporated with the answer of the commission to the question of the City Council as to the suitability of trolley buses for operation on Woodward Avenue.

The commission expressed the opinion that it would be undesirable to operate trolley buses on the unwidened section of Woodward Avenue or any other main artery of similar width. It recommended that when the widening of Woodward Avenue is completed, the tracks be moved from the center of the street and placed closer to the curb on both sides. The plan includes a local traffic lane between each track and the curb, with through traffic lanes in the center of the street between tracks.

◆

New York Approves 54 Bus Routes in Three Boroughs

Tentative approval with minor changes of 54 bus routes, six of which are in Manhattan, seventeen in Brooklyn and 31 in Queens, was given on Jan. 27 by the Committee of the Whole of the Board of Estimate of New York City. The tentative routes approved followed, in the main, the recommendations of the Board of Transportation, plus six additional routes suggested by Borough President Harvey of Queens.

British Body Against Tramways

(*Continued from Page* 109)

> course, those of the London United and the Metropolitan Company. Inspection of the new car proves that a better public vehicle for street transport cannot be found. The suggestions that such vehicles should be abandoned for those that are more costly to operate and no less obstructive to traffic is advice which should be very carefully considered before it is accepted.

The *Electric Railway Bus and Tram Journal* said:

> What criticism we ourselves have to make of the commissioners' conclusions is that they represent more the verdict of "the man in the street" rather than the considered conclusions of experts who have a knowledge of the problems which intimately affect the various forms of transport criticised.
>
> Whether tramways which are already in existence, and the tracks of which are well-maintained, and on which modern rolling stock is operated, can be accurately described as being in a state of obsolescence is a question which is open to debate. Certain it is that none of the newer forms of street transport can yet compete with the tramcar for dealing effectively with peak-hour traffic, nor, speaking generally, can they offer to the public as long, as comfortable, or as safe a journey for the same fare. The contention that tramcars are one of the worst causes of the congestion on our streets is one which on examination does not hold good.
>
> To us the most amazing dictum of the commissioners is that tramway operators should not be relieved of the obligation to maintain the road which was placed upon them by the tramways act of 1870. The injustice of that obligation in these days is so apparent that we must conclude that the commissioners did not think it necessary to give the point the consideration which it deserves.
>
> The recommendations of the commissioners so far as tramways are concerned appear to be based on considerations of the tramcar as we have known it during the last 25 years, but modern tramcars are vehicles which by virtue of speed, comfort and safety are more than comparable with the most luxurious buses. Men like Lord Ashfield, with his abundant experience of transport in London, and Sir Henry Maybury, with his knowledge of road capacities, are actually in a position to give a much more reasoned appreciation of the merits of the tramcar than any of the members of the Royal Commission.

According to *Motor Transport* a great amount of evidence has been taken and has been carefully considered by the dozen-or-so level-headed men who composed the commission, none of whom should have any particular axe to grind, but even that pronounced advocate of the motor vehicle, in contributed comment dealing with the report, tempered its enthusiasm as follows:

> It is a fact today that the cost of running a large-capacity omnibus is no higher than that for running a tram. *(sic)* But in the case of tramways enormous sums have to be spent in relaying rails and remaking roads. If the large sums of money thus spent were utilized in purchasing buses, transport would be infinitely better served, and enormous sums of capital saved. It takes a bold man, however, to carry these facts into the realms of practice.

◆

The Bow Trolley in Glasgow

Adoption on the city's tramcars of the bow collector trolley in place of the trolley wheel system is proposed by the Transport Committee at Glasgow, Scotland. When the Glasgow tramways were electrified years ago, the rigid or unswivelable wheel trolley head was adopted as representing what was considered the best practice in those days. The use of the bow collector has since then widened on the continent of Europe, and for the last five years, experiments with it have been carried on in Glasgow. It was found that the bow, now in use on 150 cars, makes for smoother running and for safety in negotiating curves. Other advantages claimed are the absence of holdup of traffic owing to the trolley wheel leaving the wire, the cars are not in darkness at turning points, and there is no whistling or sparking from the bow. Glasgow will be the first city in Great Britain to adopt the bow for all cars. Since the decision was made at Glasgow, Sunderland, a smaller system, has also decided to adopt the bow trolley on all its cars.

◆

The Drumm Storage Battery

The Irish Free State Parliament has considered a vote of £25,000 to help develop Dr. Drumm's invention of an electric storage battery for electric railway work. It is now proposed to equip with this type of battery two rail coaches, each seating 100 passengers, and capable of a maximum speed of 50 to 60 m.p.h. The hope is to secure by battery many of the advantages of electric traction without the cost of the overhead or third-rail installation and maintenance.

PERSONAL MENTION

G. O. Muhlfeld Heads Stone & Webster, Inc.

George O. Muhlfeld has been elected president of Stone & Webster, Inc. As a young construction engineer, Mr. Muhlfeld joined the staff of Stone & Webster in Seattle 25 years ago and has steadily forged ahead until, in the prime of life, he has been chosen as the chief executive of the Stone & Webster interests.

Recently as chairman of the board of the Stone & Webster Engineering Corporation, he carried on with great success, and as vice-president of Stone & Webster, Inc., has during the past ten years been regarded as one of the leading men in New York. For some years he has been on the boards of directors of all the Stone & Webster subsidiary companies. In addition he is a director of the Grace National Bank, General Public Service Corporation, Pennsylvania Power & Light Company, and several other corporations.

G. O. Muhlfeld

Mr. Muhlfeld's career has been replete with engineering accomplishments of the first magnitude. It was he who, through the entire undertaking, guided, directed, and coordinated the vast army of workers engaged in the construction of the great shipbuilding yard at Hog Island for the United States Government—one of the greatest engineering and construction accomplishments of all times. In that undertaking and in the routine of the many other undertakings for which he has been responsible, Mr. Muhlfeld has unmistakably reflected the metal of which the man is made—metal which made the thousands of men from all over the world who met him as one of the chief officers of the shipbuilding yard marvel at his ability to keep his head, meet everyone who needed to see him, and carry on successfully during that war period when all the world was under great emotional stress.

Mr. Muhlfeld was educated at Cornell University with the class of 1897 and immediately entered the engineering and construction business. One of the first of the large steam power stations which Stone & Webster built was the Post Street Station of the Seattle Electric Company in 1902. Mr. Muhlfeld was almost immediately assigned a position of importance in connection with the design and construction of this station. Thus did he begin his career. His record since then has been one of successfully carrying to completion during the past 25 years many of the major undertakings of the Stone & Webster Engineering Corporation.

◆

E. H. Utley, Jr., Indiana Railroad Auditor

Edwin H. Utley, Jr., for the past three years general auditor of the Chicago, South Shore & South Bend Railroad at Michigan City, Ind., has been elected general auditor of the Indiana Railroad, succeeding Tudor Jones, who resigned several months ago. Mr. Utley will have general supervision over the railway accounting, methods and accounting personnel of the Indiana Railroad, Interstate Public Service Company, Indiana Service Corporation, and Northern Indiana Power Company, which lines comprise the Indiana Railroad System, with headquarters in Indianapolis, Ind.

Mr. Utley has been connected with steam and electric railroads in various operating, engineering and accounting capacities for a number of years. He was also employed for a time by Arthur Young & Company, Chicago, certified public accountants, and from 1922 to 1924 held the position of auditor and assistant treasurer of the Southern Minnesota Gas & Electric Company. In 1924 he joined the accounting staff of the Midland Utilities Company which is the holding company for the Chicago, South Shore & South Bend Railroad, Indiana Railroad and other electric gas and transportation utilities in Indiana. He was elected general auditor of the South Shore Line in November, 1927.

◆

Changes in California Commission

M. B. Harris, Fresno, has been appointed by Governor Young to serve a full term of six years as successor to Thomas S. Louttit, whose term as a member of the California Railroad Commission has expired. Mr. Harris resigned as a member of the State Highway Commission to accept the appointment. He served as a member of the State Senate from 1919-1927, and has been active in civic affairs in California for many years. He practiced law as a member of the firm of Harris, Willey, Griffith & Harris up to the time of his appointment to the commission.

Fred G. Stevenot, state director of natural resources during the last four years, has been named to serve the remaining two years of the term of W. J. Carr, who has accepted a full six-year term appointment to succeed Ezra W. Decoto. Mr. Carr was originally appointed to the commission by Governor Young in July, 1927, to fill the unexpired term of the late Harley W. Brundige, named four years ago.

Another Honor for Nashville's Most Valuable Citizen

J. P. W. Brown, who for five years has been vice-president and general manager of the Nashville Railway & Light Company, has been elected vice-president of the Tennessee Electric Power Company operating light, power and railway services in Chattanooga and Nashville.

Almost from the time of his graduation from the electrical engineering department at Vanderbilt University he has been connected with the light and power industry, advancing from minor to the highest positions of responsibility. The expansion of the business of the Nashville Railway & Light Company in the last quarter of a century has been largely under his direction, and for a number of years he has been in practical executive charge of its operations.

As the Nashville *Banner* said editorially, fine intelligence, unremitting energy and a natural aptitude for dealing with men individually and along the lines of broad contacts made success in his chosen field of life work natural, and, indeed, inevitable. But Mr. Brown possesses other qualities that have contributed to his firm establishment in public esteem and have established an enduring place for him in the warm regard of the entire body of citizenship. Public spirit, in the fullest and finest sense, has been a part of his inner nature. He has given unstintedly of his time, of his effort and purse to every movement that promised public advancement, and he held positions of highest responsibility in the civic life of the city. Said the *Banner:*

J. P. W. Brown

> A man of notably generous impulses and broad sympathies, he has given sacrificial service to every public cause making appeal to humanity and philanthropy. As chairman years ago of the Community Chest and a worker for it ever since he has been a well-nigh invaluable aid. In recognition of his long and devoted service of public movements, he received five years ago that most coveted honor that can come to a citizen in private life in being named by the committee having the award in charge as "Nashville's Most Valuable Citizen."
>
> His eminent fitness for the post, one of exceeding responsibility, caused his selection by the central committee on employment, composed of 100 volunteer workers, including many of the foremost citizens of the community, as its general chairman, and to a cause calling for the most devoted and sympathetic endeavors he has addressed himself with characteristic earnestness.
>
> It would be unnatural, indeed, did not the great body of citizens view with a very real sense of interest and pleasure the success of a man who by so many tokens of worth and service had established himself so firmly in public esteem.

Utility Executive Wins Savannah Civic Honors

Howard C. Foss, chairman of the Savannah industrial committee and president of the Savannah Electric & Power Company, Savannah, Ga., has been announced as the winner of the Lucas trophy for the most outstanding effort and accomplishment for Savannah during the year 1930. The presentation of the trophy was made in January, before one of the civic clubs.

Mr. Hoynes, chairman of the committee of judges, in making the announcement of the winner, called attention to the fact that Mr. Foss has displayed a most unselfish and highly commendable spirit for the advancement of Savannah as chairman of the industrial committee and while he was under a physician's care the committee held conferences at his home. Although laboring under a very serious handicap, Mr. Foss has led the movement which has resulted in the industrial advancement of Savannah undoubtedly to a greater extent than in any other year in its history.

While his more recent efforts have been concentrated along lines of industrial development, for which he is especially fitted, Mr. Foss has also been active in the promotion of general civic betterment. He is a member of the Savannah Board of Education and the Rotary Club and as a business man stands high in the community as president of the Savannah Electric & Power Company. During the last year he displayed an indomitable will in the face of physical handicaps.

Back to Brooklyn from Buenos Aires

Theodore A. Kramer, instructor of motormen for the Brooklyn-Manhattan Transit Corporation, has resumed his duties with that company after a leave of absence secured last summer for the purpose of conducting the work of instructing motormen for service on the subway recently completed in Buenos Aires, Argentina.

Most of the men trained by Mr. Kramer had had previous surface car experience. He found them to be very apt pupils, but experienced some difficulty in acquainting them with the operation of the variable load brakes. His knowledge of Spanish was very limited, but Mr. Kramer got along well with his pupils by employing an interpreter, and when all linguistic efforts gave evidence of failing, resort to the sign language proved effective. In appreciation of his work, Mr. Kramer was presented with a gold watch by the officials of the company, and with a gold watch charm by the employees.

Mr. Kramer has been with the B.-M.T. since 1911. He has been instructor since March, 1923. Before coming to the Brooklyn company, he served for eight years in the U. S. Navy.

Three-car trains are being operated in Buenos Aires, although it is planned later to use eight-car trains. The cars, built in England, are similar to those of the B.-M.T. They seat 47 passengers and provide standing room for 150. Motors were supplied by the British General Electric Company. Propulsion is by third-rail. Trains run only from 5 a.m. to 1 a.m. The best headway is three minutes.

The new subway is known as the Ferrocarril Terminal Central de Buenos Aires. It was built by the Dwight P. Robinson Company, New York. Approximately 5 miles have been completed. A 3-mile extension is soon to be opened. The system is owned by Teophile Lacroze, who also controls the surface car lines in Buenos Aires.

Booklet on M. L. Harry Memorial

A memorial booklet on the dedication of the M. L. Harry Memorial fountain at Decatur, Ill., has been published by Illinois Power & Light Corporation, and distributed among the late Mr. Harry's friends. It contains a portrait of Mr. Harry and pictures of the fountain in operation during the day and at night.

With the pictures are the presentation speech by L. E. Fischer, vice-president of North American Light & Power Company; the acceptance speech by Mayor O. W. Smith, and the dedication address by Governor Louis L. Emmerson. A portrait of each of the speakers has been inserted to accompany the respective addresses.

Mr. Harry, long connected with the company and a prominent factor in its affairs and in the affairs of the communities which it served, was fatally injured in October, 1929, in an automobile accident.

Chairman C. L. Bradley More Active in Cleveland

C. L. Bradley

His task as "master builder" of Cleveland's Union Terminal completed, Charles L. Bradley has stepped down from the presidency of the Union Terminals Company to devote an increasing amount of his time to the Cleveland Railway. According to Paul E. Einstein, writing in the *Plain Dealer*, the withdrawal of Mr. Bradley from the terminal company means "that Bradley will probably devote the rest of his life, if necessary, to solving the Cleveland Railway's problems, since he has never left a job undone."

Mr. Bradley assumed the presidency of the Union Terminals Company in 1927 to direct and co-ordinate the construction of the terminal properties after successfully completing the Union Trust Building. He is chairman of the board of directors of the Cleveland Railway and controlling factor, along with the Van Sweringens, of the Cleveland Interurban Railroad, which operates the Shaker rapid transit lines.

These positions, it is said, will now be his principal concern, although he is chairman of the board of the Erie Railroad, occupying a similar position with the Midland Bank and presidency of the building company which controls the Van Sweringens' extensive real estate development around the Terminal. He has maintained an active interest behind the scenes of the Cleveland Railway since organization of the Metropolitan Utilities Corporation, under which the Cleveland Railway came under Van Sweringen control.

Charles Bradley attracted attention during the war as head of the Cleveland liberty loan organization—during the third, fourth and fifth campaigns. In 1919 he was made vice-president of the Union Commerce National Bank. When the Union Trust merger was completed he was made vice-president and later general manager of that company.

In 1927 the Van Sweringens asked him to take over the job of completing the Cleveland Union Terminal, and he succeeded O. P. Van Sweringen as president of the Cleveland Union Terminals Company. On April 26, 1929, he was made chairman of the board of the Erie Railroad, which is controlled by the Van Sweringens. Also, in 1928, he headed a syndicate which acquired control of the Midland Bank which has become a unit of a new building in the Van Sweringen terminal area. He is also a director of a number of other companies, including the Cleveland Hotel Corporation, Cleveland Traction Terminals Company, Otis Steel Company, White Motor Company, and the Hupp Motor Car Corporation. He was graduated from Cornell.

An Employee With a Career As a Collector

C. M. Brown, who recently commenced his thirty-seventh year of service with the Kansas City Public Service Company and its predecessors, is an employee with an unusual record of faithful service who has found time to indulge in a number of hobbies, some of which have made of him an authority in a particular line of endeavor. He has a very extensive collection of stones, minerals and rock formations. He also has a noteworthy stamp collection, and is the proud possessor of a collection of transfers which includes at least one of each type ever issued by the Metropolitan Street Railway, the Kansas City Elevated Railway, the Kansas City Railways and the Kansas City Public Service Company. He began to put this collection together in 1895 and so has become Kansas City's greatest peridromophilist.

Mr. Brown is versatile. His life outside the company shows this, but it has also been manifested in his ability within the company to adjust himself to the changes which have taken place in the art of local transportation. He knows train service best, but he has turned to other branches successfully when the need arose. Mr. Brown started with the company as a conductor when it was known as the Metropolitan Street Railway and the Kansas City Elevated Railway. With the change to one-man operation several years ago, he assumed the duties of chief mail clerk in the general office at 15th and Grand, which position he occupies at the present time. He is also mail clerk for the Kansas City Power & Light Company.

◆

Traffic Engineer for Kansas City

Thomas J. Seburn, who has been traffic engineer for Kansas City Public Service Company since 1926, and who assisted Dr. Miller McCormick in the recent traffic survey conducted in Kansas City, has been appointed city traffic engineer by Mathew S. Murray, director of public works.

Under Mr. Seburn will come most of the survey and engineering work in connection with the ten-year improvement plan recently started by Kansas City. Mr. Seburn is thirty years old. He went to Kansas City in 926 from Toledo, Ohio, on the recommendation of Dr. McClintock. He is a graduate of the University of Michigan.

T. J. Seburn

◆

New Orleans Official Heads Louisiana Engineers

Frank G. Frost, superintendent of the electric department of the New Orleans Public Service, Inc., has been elected president of the Louisiana Engineering Society. Mr Frost is a native of Mattoon, Ill., and has resided in New Orleans since 1918. He was graduated from the University of Illinois in 1901, and for the six succeeding years was employed in manufacturing plants in Chicago and vicinity. In 1907 he became affiliated with a public utility company in Birmingham, Ala. From there he went to Little Rock and Houston, and thence to New Orleans, where he immediately entered the service of the New Orleans Railway & Light Company, predecessor of the New Orleans Public Service, Inc.

◆

H. A. May Assistant to Westinghouse President

F. A. Merrick, president of the Westinghouse Electric & Manufacturing Company, announces the appointment of Herbert A. May as assistant to the president. Mr. May will make his headquarters in the Grant Building, Pittsburgh, where the offices of the Westinghouse central sales district are located.

Mr. May is identified with a number of important local manufacturing concerns and banks. He is a director of the Union Drawn Steel Company; the Mackintosh-Hemphill Company; the Pittsburgh Steel Foundry Corporation; the Davidson Ore Mining Company, of Buffalo, N. Y., the Pittsburgh & West Virginia Railroad; Forbes National Bank (Pittsburgh), and the Farmers National Bank, of Beaver Falls, Pa. He is also a director of the Pittsburgh Aviation Industries Corporation.

◆

J. M. Davidson Advanced by Tennessee Company

J. M. Davidson has been made assistant secretary and assistant treasurer of the Tennessee Electric Power Company. Mr. Davidson was assistant secretary and assistant treasurer of Nashville Railway & Light Company at the time of his recent merger with the Tennessee Electric Power Company. He will remain, as heretofore, in Nashville. His connection with the Nashville Railway & Light Company began in October, 1914. For a number of years he was in the accounting department, and was chief clerk in 1928 when elected assistant secretary and treasurer of the railway and light company, serving under B. F. Manning, who is now secretary and treasurer of the Tennessee Electric Power Company.

◆

J. J. Drumm, University College, Dublin, has had conferred on him by the Senate of the National University of Ireland the degree of Doctor of Science in recognition of his invention of the Drumm electric storage battery for railway purposes. Experiments are still in progress in Ireland with this battery, for which large claims are made.

◆

C. R. Tattam, manager of the transport undertakings of Balfour, Beattie & Company, has been appointed general manager of Bradford (England) Corporation transport undertakings, at a salary of £1,250, rising to £1,750.

◆

John E. Cullen has resigned as director of the United Railways & Electric Company, Baltimore, Md., to become general manager of the Baltimore *News* and *The Sunday American*, Hearst papers in Baltimore. He has spent a number of years with the Hearst organization in various cities. Mr. Cullen was associated with the United Railways in an executive capacity, during the readjustment period following the war.

◆

Walter J. Thompson has resigned from the advertising and publicity department of the International Railway, Buffalo, N. Y. Mr. Thompson has been associated with the company for the last four years.

◆

Samuel Kahn, president of the Market Street Railway, San Francisco, Cal., has been elected a director of the Anglo-California Trust Company. Prior to his becoming vice-president and general manager of the Market Street Railway late in 1925, Mr. Kahn had served for twelve years as vice-president and general manager of the Western States Gas & Electric Company, Stockton, Cal., now a part of the Pacific Gas & Electric Company's system. He became president of the railway the latter part of 1927.

◆

J. R. Stauffer to be Resident *Journal* Editor in Chicago

Joseph R. Stauffer, assistant editor of Electric Railway Journal, who has done notable work in New York as a contributor to the paper on a wide range of topics, will, after Feb. 1, make his headquarters at Chicago. Thus he joins the large staff of editors permanently maintained in that city by the McGraw-Hill Publishing Company, Inc., to preserve close contacts with industry. To him will fall much of the responsibility for keeping in touch with men and events in the industry in the Central West, shared previously between the Chicago and the New York offices. In effect, his work will supplement that of other members of the staff located permanently in New York, and the many contributors from the territory in the Central West.

J. R. Stauffer

Mr. Stauffer is a young man of unusual training and experience. He has been thoroughly schooled, being a graduate of the United States Military Academy, an institution meticulous in the training which its graduates receive in engineering and in the larger aspects of human relations. His business training has included periods of service in engineering, in management, and in selling, principally with the United States Ozone Company.

In transportation, Mr. Stauffer's experience has included the excellent training afforded by the cadet engineering course offered by the Public Service Co-ordinated Transport in New Jersey. Since that system embraces the operation of city, suburban and interurban service using both cars and buses in co-ordinated service, he was brought into close contact with the many operating and executive problems of this multifarious operation.

In each assignment in this work for the New Jersey company, Mr. Stauffer accredited himself with distinction, so much so that at the conclusion of his period of apprenticeship he was made a supervisor and placed in charge of the Montclair district, having under his direction all trolley cars and bus operations between Paterson, Montclair and Newark, together with interstate operation between Montclair and New York. It was from this post that he resigned in November, 1929, to join the staff of Electric Railway Journal.

C. C. Phares Made Garage Superintendent of Akron System

C. C. Phares, who has been superintendent of garages for the Akron Transportation Company for the last three years, has been appointed acting superintendent of equipment for the Akron Transportation Company, Northern Ohio Interurban Company, Cleveland-Akron-Canton Bus Company and the Canton Traction Company. He succeeds P. V. C. See, who was recently made general manager of these companies.

Mr. Phares went to Akron in 1912 and was employed by Goodyear Tire & Rubber Company. Leaving the rubber industry, he went into truck and auto car manufacturing work. He was employed by International Harvester Company as general foreman. He held that position for five years, leaving there to enter service in the World War. Mr Phares was made a sergeant and put in charge of the United States motor boats stationed at Fort St. Phillips and Fort Jackson on the Mississippi River. Later he went to France with the railroad artillery. He returned to the United States in 1919 and engaged in the building of trucks and buses. He had charge of the Zeno transportation garage and held that position until the line was taken over by Northern Ohio Power & Light Company. Shortly after that time he was made superintendent of garages.

C. C. Phares

Mr. Phares was born in Gilman, W. Va., 39 years ago.

◆

R. E. Luellen Manager at Saginaw

Ross E. Luellen has resigned as traffic representative of the Indiana Railroad, at Anderson, Ind., to become general manager of the Saginaw Transit Company, Saginaw, Mich., effective Feb. 1.

Mr. Luellen has been in the service of the Indiana Railroad and its predecessor companies for more than 27 years. He joined the Union Traction Company at Anderson as a clerk in the department of maintenance of way at the age of twenty and six months later was transferred to the claims department where he worked until 1920 as assistant claim adjuster. For the next five years, he was safety engineer of the company, editor of the company's safety magazine, and, in addition, did assigned work in public relations.

In 1925 Mr. Luellen became a solicitor in the traffic department, continuing in this capacity until July, 1928, when he was made assistant general freight and passenger agent. He held this position until the purchase of the Union Traction Company by the Indiana Railroad in July, 1930, when he was appointed traffic representative for the new company at Anderson.

As general manager of the Saginaw Transit Company, Mr. Luellen succeeds J. A. Furlong, who resigned recently because of ill health. He will have charge of both railway and bus operations in Saginaw.

Byron R. Lewis, Seattle, Wash., has been named supervisor of transportation in the department of Public Works, at Olympia, succeeding the late Enoch W. Bagshaw. Mr. Lewis has been associated with the lumber business in Skagit County for many years. He was formerly president and manager of the Puget Sound & Cascade Railway.

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Walter McCausland, publicity manager and director of the public relations department of the International Railway, Buffalo, N. Y., was elected first vice-president of the Greater Buffalo Advertising Club at the annual meeting.

◆

A. E. Pierce, Seattle Municipal Railway, Advanced

Albert E. Pierce, for nearly eleven years superintendent of maintenance for the Municipal Railway, Seattle, Wash., has been appointed to the newly created position of assistant superintendent of city utilities. The appointment was announced by George B. Avery, superintendent of utilities, who stated that he had selected Mr. Pierce from a civil service eligible list containing also the names of Roy E. Furse, superintendent of transportation for the railway system, and A. B. Hiatt, accountant for the railway. The positions of all three men have been abrogated under the economy and efficiency program adopted by the City Council upon recommendation of Mayor Frank Edwards.

Experienced in Steam and Electric Railway Work

Mr. Pierce is former track superintendent of the Seattle Municipal Street Railway Department. He was born in Perry, Iowa, on March 8, 1888. He was educated in the public schools of Chicago, augmenting his grade and high school work by attending the Lewis Institute of Technology in Chicago.

From 1907 to 1912 he was employed on the main and branch line reconnaisance location and construction of the Chicago, Milwaukee & St. Paul Railway, Pacific Coast Extension; from 1912 to 1914, engaged in private engineering practice and engineering work on the Olympic Peninsula, in the state of Washington; from 1914 to 1915, assistant superintendent in charge of building state highways along Hood Canal and from 1916 to 1917, assistant superintendent of tunnel construction, department of public works in Chicago, constructing a 3-mile water tunnel under Lake Michigan at Wilson Avenue.

From Aug. 27 to Nov. 27, 1917, Mr. Pierce attended the Officers Training Camp at Fort Sheridan, Ill., and on the latter date was commissioned a First Lieutenant of field artillery, reporting in France on Jan. 9, 1918.

Saw Service in France

Graduating from the field artillery school at Samur, France, and French artillery school at Paris, he was instructor of 32d Brigade of Coast Artillery and was later assigned to the 59th Coast Artillery Regiment, serving as battery, battalion and regimental officer in the Saint Mihiel and Meuse-Argonne offensives. He was discharged from the army at Camp Upton, N. Y., on Feb. 5, 1919.

A. E. Pierce

On his return to Seattle, Mr. Pierce was appointed assistant chief engineer of the Municipal Street Railway department on April 1, 1919, the day the Seattle system was taken over from the Puget Sound Power & Light Company, and on March 24 was appointed superintendent of railway maintenance, which position covered among other things, tracks, trolley, distribution system and cable lines.

◆

E. J. Hopple Named to Ohio Commission

Edward J. Hopple, Cleveland, has been nominated a member of the Ohio State Utilities Commission by Governor George White. Mr. Hopple was educated in the public schools, Heidelberg College and Western Reserve law school. He was a member of the State Legislature for four terms. He was in the Senate from 1913 to 1916 and a member of the house from 1917 to 1920, serving as speaker in his last term. In 1916 he was a candidate for lieutenant governor, but failed to get the nomination. In 1926 he ran for county prosecutor, but was defeated by Edward C. Stanton.

Mr. Hopple succeeds Judge William Klinger (Democrat), Lima, who has been appointed to the Fourth District Court of Appeals bench. The political complexion of the commission will remain unchanged, with two Republicans and one Democrat.

The appointment of Mr. Hopple to the state regulatory body has since been confirmed by the Senate. The appointment is for a six-year term, ending in February, 1937.

OBITUARY

C. L. Doub

C. L. Doub, assistant engineer in the office of the engineer of electric traction Reading Company, died of pneumonia at his home in Oreland, Pa., on Jan. 21, following a short illness.

After a wide range of experience in the electric railway field, Mr. Doub turned his attention to the problem of heavy electrification when in January, 1923, he entered the service of the Illinois Central Railroad on its Chicago Terminal electrification where he handled the substation, power and general matters in connection with this work. In 1927 he left the Illinois Central to accept the position of assistant engineer in the office of engineer electric traction engaged in the electrification of the suburban lines of the Reading Company in Philadelphia, Pa., which position he held at the time of his death.

C. L. Doub

Mr. Doub was born on June 3, 1897, at Washington, D. C. His primary education was received at Middletown High School. He worked as substation operator with the Hagerstown & Frederick Railroad prior to entering Johns Hopkins University, where he was graduated in electrical engineering in 1919, following his discharge from the U. S. Army. After he was graduated, he was employed for three years in the railway engineering department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa. He next was engaged for one year with the Milwaukee Electric Railway & Light Company on special traction studies.

He was vice-chairman of committee on substations of electrical section, American Railway Association; vice-chairman of committee on power rectifiers of the American Electric Railway Association and an associate of the A.I.E.E.

◆

Emile Garcke

Emile Garcke, one of the most prominent figures in finance and administration in connection with electric railway work in Great Britain, died recently at the age of 74. A native of Germany, Mr. Garcke went to England in his youth and became a naturalized British subject. After some time spent in mining and banking enterprise, his career in connection with the electrical industry began in 1883, with his appointment as secretary of the Brush Electrical Engineering Company. Ten years later he became managing director of the Electric Construction Company. In 1895 he formed the British Electric Traction Company, and as managing director he was instrumental in organizing a large number of electric tramways in England. The success and number of these subsidiary companies would probably have been still greater but for the development of municipal tramway enterprise.

Mr. Garcke was also associated with various power supply companies, and held the position of president of the British Electrical Federation. He was also largely responsible for the form which legislation took in regard to electrical supply, as he served as a member of various public official committees. Among other things, he was instrumental in founding the electrical section of the London Chamber of Commerce, was a member of the board of the Federation of British Industries, and a vice-president of the Tramways & Light Railways Association. His "Manual of Electrical Undertakings," an annual publication, is one of the standard books of reference in Great Britain. The width of Mr. Garcke's interests may be judged by the fact that he studied philosophy, published a book on the subject, and was one of the founders of the British Institute of Philosophy.

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E. P. Clark

Eli P. Clark, pioneer builder of electric railway lines in Southern California and Portland, Ore., died on Jan. 16 at Los Angeles, Cal., following a heart attack. He was 83 years of age.

In association with Gen. M. H. Sherman, his brother-in-law, Mr. Clark organized the Los Angeles Consolidated Railway, now the Los Angeles Railway; the Los Angeles & Pasadena Electric Railway, which later became the first unit of the Pacific Electric Railway; the Los Angeles Pacific Railway, later sold to the Southern Pacific Company, and built the Mount Hood Railway & Power Company system at Portland, Ore. Control of this company later passed to the Portland General Electric Company.

The first section of the Los Angeles Consolidated Railway had been constructed and was in operation July 1, 1891, and by August, 1893, consolidation of all the horse car and cable lines of the city into one system and their conversion into a pioneer electric railway organization had been accomplished.

Early in 1894 Mr. Clark urged the building of a line between Los Angeles and Pasadena, 10 miles distant, and soon acquired the horse car lines of Pasadena. The Los Angeles & Pasadena Electric Railway was organized, and on May 5, 1895, the road was opened.

With the completion of the Los Angeles & Pasadena line, Mr. Clark acquired the steam railroad operating between Los Angeles and Santa Monica, on the coast, and opened the line for traffic in 1896 as the Los Angeles Pacific Railway. Between 1896 and 1909, when the line passed to the control of the Southern Pacific Company, Mr. Clark and General Sherman fostered the construction of more than 200 miles of suburban and interurban electric railway.

In 1906 Mr. Clark organized the Mount Hood Railway & Power Company, at Portland, Ore. This company constructed 25 miles of road and a large hydro-electric plant. In 1911 he sold the property.

Mr. Clark was born Nov. 25, 1847, at Solon, near Iowa City, Iowa. He went to Prescott, Ariz., in 1875. There he remained until 1891 when he went to Los Angeles. When he reached Los Angeles, then a place with 50,000 inhabitants, the town was on the verge of bankruptcy following the collapse of a real estate boom. The building of the first electric railway by Mr. Clark stimulated the resumption of business and renewed activity in real estate.

◆

John Benham

John Benham, vice-president of the International Register Company, Chicago, Ill., since 1903, died on Jan. 12 at the age of 84 years. He was one of the best-known men in the electric railway industry and attended all of the conventions for more than 25 years. He was especially active in the affairs of the Central Electric Railway Association to the success of which he contributed materially. On Jan. 11 the day before he died he had been a member of the Union League Club of Chicago for 50 years. He was very active in that organization and at one time served as chairman of its public affairs committee.

John Benham

Mr. Benham was born in 1846 in Western Star, Ohio, but was reared at Canandaigua, N. Y. When still a young man he moved to Chicago to begin his business career as a member of the firm of Smith, Benham & Aiken, later joining the firm of C. H. Fargo & Company, a wholesale shoe concern. From 1888 to 1890 he was superintendent of public service in Cook County, the first appointee to that office. From 1896 to 1903 he was vice-president and general manager of the Consumers Company, manufacturers of ice. After the sale of the Consumers Company in 1903 he became vice-president of the International Register Company.

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E. H. Harrison, assistant claims attorney for the Jacksonville Traction Company, Jacksonville, Fla., died on Jan. 4 as a result of injuries which he received three weeks previously when he was run down by an automobile. He had been connected with the company for many years. Mr. Harrison was 54 old.

INDUSTRY MARKET AND TRADE NEWS

Shipment of Thirty Cars Bound for Chile

Thirty cars, for two-man operation, have been shipped from Brooklyn on a 5,000-mile sea voyage to Santiago, Chile. The cars were purchased by Cia. Chilena de Electricidad, Limitada, for Cia. de Traccion y Alumbrado de Santiago at a cost of nearly $500,000 from J. G. Brill Company, of Philadelphia. The shipment will go by water to Valparaiso and then by rail to Santiago. Each car was carefully crated in cases 43 ft. long, 9 ft. wide and 10 ft. high. The task of loading the twelve ton cars from lighters to the new motor ship *Tolton* was accomplished by a 40-ton derrick rigged up at hatch No. 2. A roll of trolley wire, weighing 13 tons, was also included in the shipment.

Detailed specifications are as follows:

Name of railway	Cia Chilena de Electricidad, Ltd., Sanitago, Chile
Number of units	30
Type	Two-man, motor, passenger, interurban, double end, double truck
Number of seats	50
Builder of car body	J. G. Brill Co., Cleveland, Ohio
Date of order	June, 1930
Date of delivery	November, 1930
Weights:	
Car body	16,200 lb.
Trucks	15,700 lb.
Equipment	2,000 lb.
Total	33,900 lb.
Bolster centers	19 ft. 10 in.
Length over all	42 ft. 6 in.
Length over body posts	29 ft. 10 in.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 5½ in.
Height, rail to trolley base	10 ft. 6 in.
Body	All steel
Roof	Arch
Doors	End, folding
Air brakes	General Electric Co.
Axles	Brill
Car signal system	Consolidated Car Heating Co.
Compressors	General Electric Co., CP-27-B
Conduit	Duratube
Control	K-75
Couplers	Brill
Curtain fixtures	Adams & Westlake
Curtain material	DuPont DF 583
Destination signs	Hunter
Door mechanism	Consolidated Car Heating Co.
Doors	Mahogany
Finish	Duco
Floor covering	U. S. Rubber Co. asphalt tiling
Glass	Body, D.S.A.; doors, ½ in. clear wire, vestibule, plate
Hand brakes	Peacock Staffless
Heaters	Cons. Car Heating Co., cross seat and panel type
Headlights	Ohio Brass
Headlining	Agasote
Interior trim	Mahogany and steel
Journal bearings	Plain
Journal boxes	Brill
Lamp fixtures	Graybar Elec. Co., small dome type
Motors	Four, GE265 L, inside hung
Painting scheme	Yellow, cream and red
Roof material	Cypress, canvas covered
Safety car devices	Safety Car Devices Co.
Sash fixtures	Adams & Westlake
Seats	Brill No. 201
Seat spacing	31 in.
Seating material	Rattan
Slack adjusters	Brill mechanical
Steps	Stationary
Step treads	Kass
Trolley catchers	Ohio Brass Co.
Trolley base	Ohio Brass Co.
Trolley wheels	Ohio Brass Co.
Trucks	Brill 177 E 1 X
Ventilators	Railway Utility Co.
Wheels	Steel tired, 26 in. diameter
Wheelguards	H-B lifeguard

Spacious interior affords comfortably spacing for 50 rattan seats

◆

British Firms Bid for Car Equipment

Bids for 50 cars and equipment, required for an inter-running agreement with the London County Council Tramways, were received by the Borough Council of Leyton, which adjoins London on the northeast. The cars will be of same design as those recently delivered to the London County Council.

The order for 50 double-deck car bodies was awarded to the English Electric Company and the order for the electrical equipments to the British Thomson-Huston Company. The Electro-Mechanical Brake Company will supply the center-bearing swing-bolster trucks. The order for 50 sets of magnetic track and wheel brake equipment was awarded to the Metropolitan Vickers Electrical Company.

Thirty cars for two-man operation have recently been shipped to Chile. These cars will be placed in interurban service

Pacific Electric Receives Fifteen New Cars

Fifteen new cars have recently been delivered to the Torrance Shops of the Pacific Electric Railway where the motors, air brakes, control and other electrical equipment will be installed. The cars were constructed by the St. Louis Car Company, and have been designed for either one-man or two-man operation.

The cars are of all-steel construction, weighing 38,000 lb., and have a seating capacity of 40 passengers. Low step height, rear-exit treadle-operated doors, and automatic power control are the safety features included. Other specifications of the cars are: roller bearing journals; brake-valve operated front door; cast-steel truck frames; improved dome type lights; Flexolith composition flooring; upholstered leather semi-individual seats; and four 35-hp. motors.

◆

Illinois Terminal Railroad Obtains Switcher

Three sources of power are available for the 95-ton combination switching locomotive obtained by the Illinois Terminal Railroad for service in the St. Louis industrial district. The engine is similar to those recently supplied to the Illinois Central for use in the Grant Park district of Chicago.

This combination electric switching locomotive is a three-powered unit. It is designed to operate ordinarily off the trolley wire either through a pantagraph or a trolley pole. Over routes where external power is not obtainable, two 66-kw. generators, each direct-coupled to a 160-hp. furnace oil engine, supplemented by storage batteries, furnish driving power to the motors. The switcher may be operated directly from the batteries for a limited period. The motors have a rated capacity of 1,000 hp.

The locomotive has been primarily designed for industrial switching in metropolitan areas. However, when operating on a 1,500-volt trolley it may be used for freight service within the rated capacity. The change from trolley to internal power is accomplished within a few seconds.

◆

Signal Contract Awarded

The Board of Transportation of New York City has awarded contract for interlocking and signaling equipment to the General Railway Signal Company, subject to approval by the Board of Estimate. Its bid was $2,178,000. In September General Railway Signal Company got a contract for $2,745,000 for similar work on Fulton Street to Harlem River line. The same company also received a $269,140 award from the city for Nassau Street line and extension of Nassau Street Eastern line from Sixth to Eighth Avenues.

In addition to the program for the new lines the Board of Transportation is planning the completion of the construction called for in the dual contracts of 1913. It has completed the shops and storage yard for the Interborough and a repair plant and several miles of track for the B.-M.T.

Bus Deliveries

Aurora, Elgin & Fox River Electric Company, Aurora, Ill., one A.C.F., 27-passenger street car type.

Blue Ridge Transportation Company, Hagerstown, Md., five White, Model 54.

Boston Elevated Railway, Boston, Mass., five Twin Coach, large capacity urban.

Cincinnati Street Railway, Cincinnati, Ohio, eighteen Twin Coach, large capacity urban.

Community Traction Company, Toledo, Ohio, four Mack, Model BC; two White, Model 65.

Connecticut Company, New Haven, Conn., five Yellow Coach, 38-passenger city type.

Denver Tramway Corporation, Denver, Col., one Yellow Coach, 21-passenger city type.

Erie Railway, Erie, Pa., three Yellow Coach, 21-passenger city type.

Fishkill Electric Railway, Beacon, N. Y., one Mack, Model BG.

Florida Motor Lines, Orlando, Fla., ten White, Model 54.

Honolulu Rapid Transit, Honolulu, H. I., one White, Model 53.

Houston Electric Company, Houston, Tex., twelve Twin Coach, urban type.

Illinois Power & Light Corporation, Chicago, Ill., three Yellow Coach, 29-passenger city type, and two 21-passenger city type.

Key System Transit Company, Oakland, Cal., two Twin Coach, urban type.

Laurel Line Bus Company, Scranton, Pa., five White, Model 65.

Los Angeles Railway, Los Angeles, Cal., one White, Model 54.

Middlesex & Boston Street Railway, Newtonville, Mass., two White, Model 65-A.

Oklahoma Railway, Oklahoma City, Okla., two yellow Coach, 21-passenger city type.

Pittsburgh Motor Coach Company, Pittsburgh, Pa., twelve White, Model 65.

St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., one Mack, 26-passenger city type.

Scranton Bus Company, Scranton, Pa., five White, Model 54.

Springfield Street Railway, Springfield, Mass., nine Yellow Coaches, 38-passenger city type.

Tennessee Electric Power Company, Chattanooga, Tenn., two Twin Coach, small capacity urban.

Trenton Transit Company, Trenton, N. J., nine Twin Coach, suburban express type.

Washington Railway & Electric, Washington, D. C., six Yellow Coach, 29-passenger city type.

A. G. Bean Assumes Presidency of The White Company

Robert W. Woodruff, chairman of the board of directors of the White Motor Company, recently announced the election of Ashton G. Bean to succeed him as president of the company. Mr. Woodruff's retirement as president and Mr. Bean's election took place at a meeting of the directors in Cleveland. Further action of the meeting was the election of Mr. Bean and W. King White, president of the Cleveland Tractor Company, as directors of the White Motor Company.

Mr. Bean has been president of Bishop & Babcock Manufacturing Company, Cleveland, for a number of years. He began his business career in St. Louis as a banker, under the late Festus G. Wade, who was president of the Mercantile Trust Company of that city, and later became president of the Dean Electric Company, of Elyria, Ohio, now the General Industries Company. Mr. Bean assumed the presidency of the White Motor Company upon his return from Africa just before Christmas.

Speaking of the position of the White Motor Company, Mr. Woodruff said:

> We have taken advantage of conditions to develop new models in trucks and buses, particularly in heavy-duty models; these developments have been paid for out of current earnings. We have avoided any reduction in the hourly wage rates. We put into operation the "stagger" system of employment, a plan which has enabled us to continue jobs for our force, and which has been so widely followed in industries throughout the country.
>
> Operations so far this year show a profit. December orders ran ahead of December, 1929. The financial position of the company is exceedingly strong. Its ratio of current assets to current liabilities, which stood at ten to one at the end of 1929, is improved. Dividends were continued through the year 1930 at double the 1929 rate.

New Appointments by Bendix-Westinghouse

Bendix-Westinghouse Automotive Air Brake Company at Pittsburgh announces the following changes in its organization: Fred L. Hall, formerly Southeastern district manager, becomes service manager. D. H. Robinson leaves his post as representative in the Cleveland territory to fill his appointment as production service manager. Both men will make their headquarters in the company's general offices at Pittsburgh and will be in direct charge of the recently inaugurated Bendix-Westinghouse factory reconditioning plan. To fill the vacancy created by Mr. Robinson's appointment, J. P. Weber, previously connected with the Chicago office, goes to Cleveland. A. Vance Howe, formerly with the New York office, transfers to Chicago as assistant district sales manager. A. R. Leukhardt leaves the Detroit office to become representative in New York City, with headquarters at 150 Broadway.

Organization of J. G. Brill Company Made More Effective by Changes

In preparation for an expected increase of activity in the transportation field, the J. G. Brill Company announced several changes in its organization by which it will be able to market the products of its plants to better advantage. These changes have been intended to present a more unified picture of the extensive car-building facilities operated by Brill.

Three associate plants of the company have been renamed. American Car Company, St. Louis, is now the J. G. Brill Company of Missouri; the G. C. Kuhlman Car Company, Cleveland, is the J. G. Brill Company of Ohio; and the Wason Manufacturing Company, Springfield, Mass., is the J. G. Brill Company of Massachusetts.

For sales purposes, the United States is divided into two regions. The Eastern region is under the direction of George Frey, vice-president, with headquarters in Philadelphia; the Western region, with headquarters in Chicago, is under the direction of W. J. Cummings, vice-president. The Eastern region contains five districts, as follows:

District No. 1—Headquarters are at the J. G. Brill Company of Massachusetts, Springfield, Mass. C. F. Johnson is vice-president and general manager, and R. T. Foster is district sales representative. This district covers the states of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

District Nos. 2, 3, and 5—Headquarters are at the J. G. Brill Company, Philadelphia. E. T. Deal is district sales representative for District No. 2, comprising the state of New York, outside the Metropolitan area of New York City, Pennsylvania, east of Johnstown, and New Jersey, except Newark and Camden. District No. 3, with S. T. Bole as district sales representative, includes the metropolitan area of New York City, and Newark and Camden in New Jersey. District No. 5, with W. M. Horsell as district sales representative, comprises the states of Alabama, Delaware, Florida, Georgia, Maryland, Mississippi, North Carolina, South Carolina, Tennessee (except Memphis), Virginia, the District of Columbia, and the cities of Philadelphia and Chester in Pennsylvania.

District No. 4—Headquarters are at the J. G. Brill Company of Ohio, Cleveland. H. K. Hauck is vice-president and general manager; H. G. Arthur, district representative; C. N. Pittenger, representative. Kentucky, Michigan (except the northwestern part) Ohio, Pennsylvania west of Johnstown, West Virginia and part of Indiana are included in this district.

The three districts in the Western region are arranged as follows:

District No. 1—Headquarters are at the Harris Trust Building, Chicago; A. P. Jenks, is assistant to vice-president. This district covers the states of Illinois except the city of East St. Louis, Iowa, the northwestern part of Michigan, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin and part of Indiana.

District No. 2—Headquarters are at the J. G. Brill Company of Missouri, St. Louis; R. S. Hood, Jr., is district sales representative. This district covers the states of Arkansas, Kansas, Louisiana, Missouri, New Mexico, Tennessee, Texas, the city of East St. Louis in Illinois, and the city of Memphis in Tennessee.

District No. 3—Headquarters are at the J. G. Brill Company, Rialto Building, San Francisco, Cal.; D. W. Dodge is Pacific Coast representative. This district covers the states of Arizona, California, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming.

With this arrangement, the Brill organization will possess close contact with every electric railway in the United States and will be equipped to make shipments economically to all points.

Provision has also been made for closer co-operation with operating companies by concentrating the servicing of all cars, trucks, rail motor cars, trolley buses, seats, and other Brill products in one department. This new general service department is under the direction of F. E. Stone, service manager, with headquarters at Philadelphia.

C. O. Guernsey has been appointed chief automotive engineer. In addition to supervising all engineering on automotive vehicles, he will also supervise the engineering of electric trolley buses.

This all-welded steel cab for a 75-ton industrial locomotive has been constructed at the Erie plant of the General Electric Company. Welding is said to have simplified manufacture and reduced the amount of metal required.

South Bend to Open Freight Terminal

Chicago, South Shore & South Bend Railroad completed a new freight terminal ready for use in South Bend in the early part of January. Completion of driveways and other outdoor work may be delayed because of the weather. Temporary drives, however, will enable South Shore Line shippers to take advantage of the new facilities as soon as work of remodeling the buildings and laying the rails has been finished. Construction of this terminal for space in South Bend is in line with the railroad's policy of providing ample facilities to take care of the future requirements of the busy industrial area it serves. The project involves an expenditure of more than $350,000, and will furnish several desirable industrial buildings on sites which, by reason of their location and advantageous switching facilities, can be made available for industrial tenants. Parts of three buildings on the 16-acre tract will be used for inbound and outbound freight terminals, and for freight and traffic department offices. Unused portions of these structures and five other buildings will provide room for expansion of the freight department and quarters for industrial tenants.

The freight terminal is one mile west of the South Bend business center and lies in a rapidly growing industrial district. Approximately 1 mile of track has been laid. A single track leads from the South Shore main lines at Meade Street and runs about five blocks along the Northern Indiana Electric Railway's right-of-way. Double and triple trackage serves the inbound and outbound freight houses.

◆

Illinois Terminal Railroad has recently ordered fifteen underframes from the American Car & Foundry Company.

Electric Railway Material Prices
January 27, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	10.00
Lead, cents per lb	4.75
Nickel, ingot, cents per lb	35.00
Zinc, cents per lb	4.45
Tin, Straits, cents per lb	25.75
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	34.00
General service	30.00

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	0.95
Kansas screenings, Kansas City	1.50
Big Seam, Ala., mine run	1.68
Smokeless mine run, Chicago	2.00

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, 9/16-in. and larger, per 100 lb.	2.80
Tie plates, steel, cents per 100 lb	1.95
Angle bars, cents per 100 lb	2.75
Track bolts, per 100 lb	3.90
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	1.35

Hardware—Pittsburgh

Wire nails, per keg	$1.95
Sheet iron (24 gage), cents per lb	2.35
Sheet iron, galvanized (24 gage), cents per lb.	2.95
Auto body sheets (20 gage), cents per lb	3.30

Waste—New York

Waste, wool, cents per lb	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	8.00–11.00
Colored	7.00–10.00

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb	9.20
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), per gal	0.40
Putty, 100 lb. tins, cents per lb	5.50

Wire—New York

Bare copper wire, cents per lb	11.75
Rubber-covered wire, No. 14, per 1,000 ft.	$4.65
Weatherproof wire base, cents per lb	12.75

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt (Texas), in package, N. Y., per ton.	22.50

Scrap Metal—New York

Heavy copper, cents per lb	8.00
Light copper, cents per lb	7.00
Heavy brass, cents per lb	4.25
Zinc, cents per lb	2.50
Lead, heavy, cents per lb	3.50
Mixed babbit, cents per lb	3.50
Battery lead plates, cents per lb	1.20

Old Material—Chicago

Steel car axles, net ton	$13.25
Cast iron car wheels, gross ton	11.00
Steel car wheels, gross ton	13.75
Leaf springs, cut apart, gross ton	13.75
Angie bars, gross ton	12.00
Brake shoes, net ton	8.00
Steel rails (short), gross ton	12.75
Relaying rails, gross ton (65 lb. and heavier)	28.50
Machine shop turnings, gross ton	4.50

F. W. Peek, Jr., Chief Engineer of Pittsfield Works

F. W. Peek, Jr., has been appointed chief engineer of the Pittsfield, Mass., works of the General Electric Company to succeed Guiseppe Faccioli, who retired a few months ago from active participation in the affairs of the company because of ill health.

Mr. Peek, who has been a consulting engineer of the company at Pittsfield, entered the General Electric Company "on test" in 1905, following graduation from Leland Stanford University in the same year. When the consulting engineering department was formed by Dr. Charles P. Steinmetz in 1909, Mr. Peek was one of the first to join it. Since then he has done general consulting work on practical and theoretical engineering problems and research work. In 1911 he received the degree of Master of Electrical Engineering from Union College for work done in connection with high-voltage transmission. Other honors bestowed upon him include the Thomas Fitch Rowland prize from the American Society of Civil Engineers in 1923, and the Levy medal from the Franklin Institute in 1926.

◆

TRADE NOTES

The White Company announces two promotions in the sales department. R. H. Webb-Peploe, formerly district manager at New York City, has been appointed regional vice-president to assume charge of the metropolitan region, with headquarters at Long Island City.

R. L. Boughton becomes manager of the export region, with headquarters at Cleveland. Mr. Boughton replaces Thomas Blagden, Jr., resigned.

✦

Illinois Testing Laboratories, Inc., Chicago, Ill., has appointed James H. Knapp Company, 4920 Loma Vista Avenue, Los Angeles, with a branch in San Francisco, as its exclusive Pacific Coast distributor of its products for industrial purposes. These include portable and stationary indicating pyrometers, resistance thermometers and other electrical and magnetic measuring instruments.

✦

Cutler-Hammer announces that the Philadelphia sales office has been moved to the tenth floor of the new Terminal Commerce Building, at 401 North Broad Street. These new quarters include warehouse facilities, where a stock of the more popular C-H motor control, wiring device and safety switch items will be carried for immediate delivery. F. J. Burd is manager of the Philadelphia district.

✦

Harry S. Ransom has been appointed manager of sales of the Fort Pitt Steel Casting Company, McKeesport, Pa. After an absence of a few years from the steel foundry industry, Mr. Ransom returned last spring as special representative of the sales and engineering department at Fort Pitt.

✦

Ohio Brass Company, Mansfield, Ohio, announced the appointment of Pirelli S/A, with offices in Rio de Janeiro and Sao Paulo, as its Brazilian agent in South America. This appointment became effective Jan. 1. Pirelli S/A maintains an extensive selling organization throughout Brazil.

We hope

that your 1931 accident record will be the lowest in the history of your property

---

Protect your rolling stock with PEACOCK STAFFLESS BRAKES

NATIONAL BRAKE CO., INC.
BUFFALO, N. Y.

Canadian Representative
Lyman Tube & Supply Co., Ltd., Montreal, Can.
The Ellcon Company—General Sales Representatives,
50 Church Street, New York

Cities Service lubricants

help reduce mechanical road failures

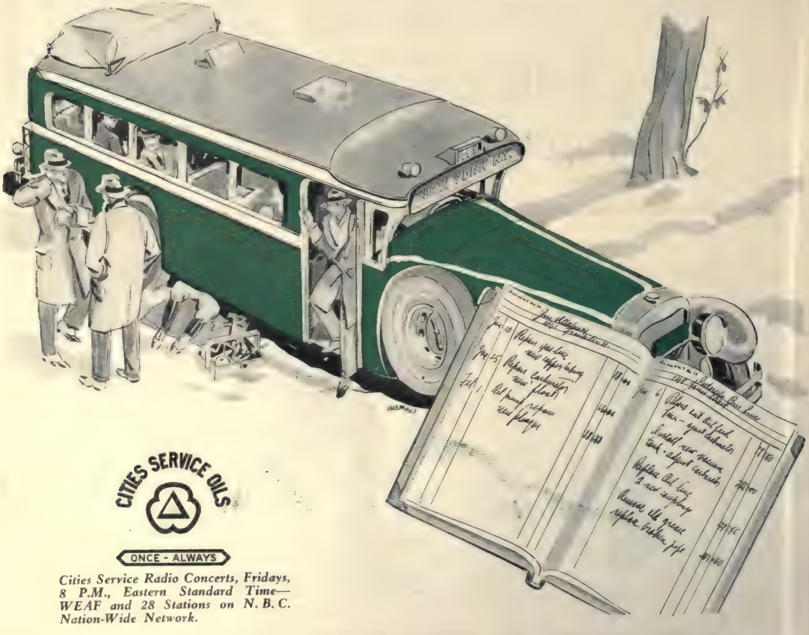
ROAD failures are costly to bus operators from the standpoint of unnecessary expense and unfavorable effect on passengers.

The tried and proved quality of Cities Service petroleum products is enabling a constantly growing number of large operators, the country over, to avoid frequent, unnecessary mechanical road failures.

In addition to being refined from choice crudes, Cities Service products are tested for actual road service, day after day, in the giant fleet of more than 4000 Cities Service motor vehicles, *including many passenger buses.* In this practical proving ground, Cities Service lubricants must prove their ability to give perfect performance and constant protection—*before they are ever offered for your use.*

If you are interested in lowering your maintenance costs, reducing road failures, minimizing repair and replacement expense, you will find Cities Service lubricants of definite assistance in accomplishing these objectives.

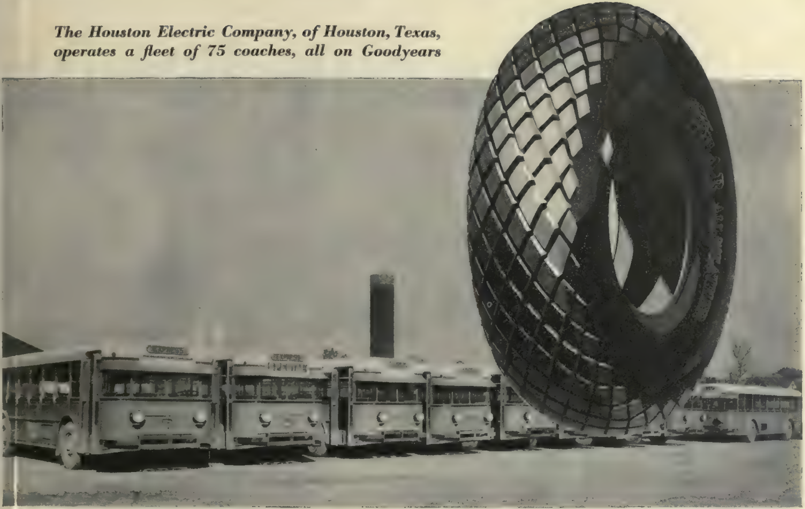
CITIES SERVICE COMPANY
60 Wall Street, New York City


NEW YORK N.Y.
Jan 10 Repair gas line new copper tubing
Jan 25 Repair carburetor new float
Feb 1 Oil pump repair new plunger
Jan 6 Blow out oil feed line - adjust carburetor
Install new vacuum tank - adjust carburetor
Replace oil line 2 new couplings
Remove old grease replace broken pipe

CITIES SERVICE OILS
ONCE - ALWAYS

Cities Service Radio Concerts, Fridays, 8 P.M., Eastern Standard Time—WEAF and 28 Stations on N. B. C. Nation-Wide Network.

The Houston Electric Company, of Houston, Texas, operates a fleet of 75 coaches, all on Goodyears



3,107,460 BUS MILES ON HOUSTON'S STREETS

Figures like these tell why Goodyear Tires are selected as standard equipment by so many motor coach operators. On the city lines of the Houston Electric Company last year, one tire traveled 65,000 miles. Another did 55,502 miles. Another, 55,227. Another, 45,476. Another, 45,000. Another, 35,866.

Back of such mileage figures is a bigger reason for using Goodyears — whether in city traffic or on fast, long-haul interstate routes, Goodyear Bus Balloons give you dependable service. In any weather, on any road, they give utmost help in maintaining schedules safely and comfortably, with a minimum of road delays.

No matter what your motor coach requirements, Goodyear Bus Balloons will meet them — with satisfaction and economy.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS

The coach with

MODEL 90 STREET CAR COACH

FARGO
BUILT BY CHRYSLER MOTORS

FARGO

Seat . . . Standee Appeal

In actual service the original, advanced Fargo "8" Street Car Coaches have proved—and proved conclusively—their ability to attract patronage by their comfort, safety and smooth performance. Seats of deep spring construction provide for 21 passengers. Two large loading wells and the 22-inch aisle (measured at seat cushions) provide comfortable space for upwards of 40 standees. Vacuum-operated entrance and exit doors are 24 inches in clear—assurance of easy, safe and rapid passenger-circulation. Thus, riders—whether seated or standing—find the all-around comfort that wins their continued patronage.

CHASSIS FEATURES

120-HORSEPOWER, 8-CYLINDER ENGINE
HEAVY-DUTY 4-SPEED TRANSMISSION
172-INCH WHEELBASE
DEMOUNTABLE POWER PLANT—REMOVABLE IN LESS THAN 1 HOUR
FULL-FLOATING, WORM-DRIVE REAR AXLE
10-INCH DOUBLE-DROP FRAME
SHORT TURNING RADIUS—27 FEET
4-WHEEL, INTERNAL HYDRAULIC BRAKES WITH BOOSTER
DESIGNED THROUGHOUT FOR MOTOR COACH SERVICE

MOTOR CORPORATION

DETROIT, MICHIGAN
DIVISION OF CHRYSLER CORPORATION

MONOTUBE POLES

All These Advantages Combined:

LOW COST

LONG LIFE

GREAT STRENGTH

MONOTUBE CONSTRUCTION

COLD-ROLLED STEEL

COMPLETE VENTILATION

ATTRACTIVE APPEARANCE

ADAPTABILITY

Monotube Pole with steel base and anchor rods. Right, close-up of base.

YEARS ahead in design, appearance and construction, the Union Metal Monotube Pole offers many unique advantages . . . outstanding features which are not to be found in any other pole.

Monotube Poles are manu-

UNION METAL

—YEARS AHEAD!

factured from high grade open-hearth steel which is further improved by the Union Metal cold-rolling process.

Monotubes are made of one continuous steel plate . . . forming a tapered pole, with an electric welded vertical seam. There are no horizontal joints or seams.

Better appearance as well as longer life result from this method of manufacture.

Poles will be furnished ready to embed in the ground or concrete (with or without ground collar) . . . or with anchor rods as desired.

These are features which you cannot afford to overlook when specifying poles. And they can be secured in Monotubes at prices which compare favorably with those of ordinary steel poles.

Before you place orders for your 1931 Pole requirements, let us supply full information and prices. . . . Write our nearest office or distributor today.

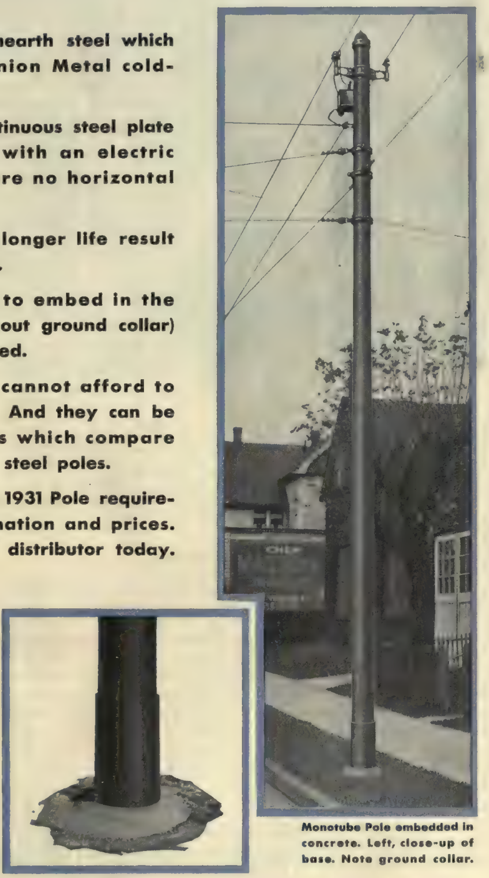
THE UNION METAL MANUFACTURING CO.

General Offices & Factory: Canton, O.

Sales Offices: New York, Chicago, Boston, Los Angeles, San Francisco, Dallas, Atlanta, Seattle.

DISTRIBUTORS:
General Electric Merchandise Distributors
Graybar Electric Company, Inc.

Abroad:
The International General Electric Co.
The Canadian General Electric Co.

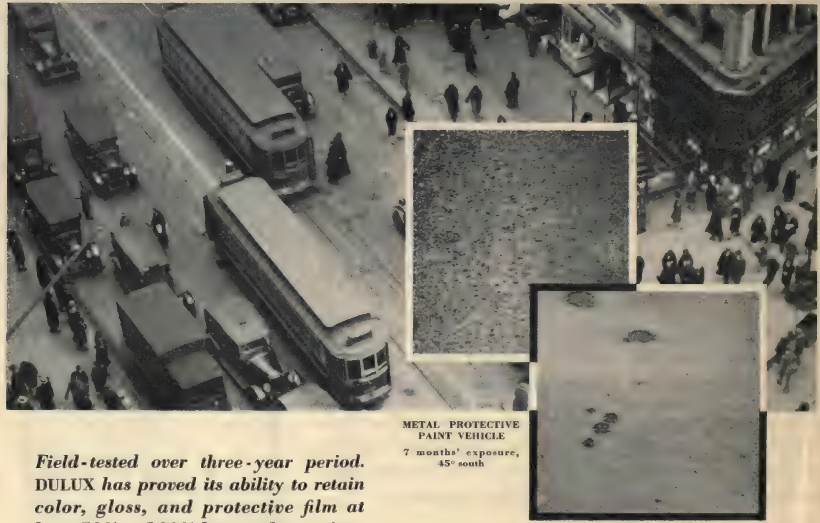


Monotube Pole embedded in concrete. Left, close-up of base. Note ground collar.

MONOTUBE POLES

Du Pont DULUX

cuts upkeep costs on all equipment



METAL PROTECTIVE PAINT VEHICLE

7 months' exposure, 45° south

DULUX VEHICLE 19 months' exposure 45° south

More than 175% longer life for Dulux! The 45° southern exposure is twice as severe as ordinary exposure. To insure shorter and more accurate tests, each of these steel panels was given a single coat of the clear vehicle without rust-inhibitive pigments.

Field-tested over three-year period.* DULUX *has proved its ability to retain color, gloss, and protective film at least* 50% to 100% longer *than paints, varnishes and enamels

An amazing chemical development ... the greatest since DUCO

THERE is hardly a surface on the road on which you cannot cut your maintenance cost with an entirely new type of finish—Dulux. Bridges . . . towers . . . structural steel . . . stations . . . rolling stock, all property can be improved in appearance, protected more completely, yet refinished less frequently. Signs will be more attractive, semaphores more visible, with Dulux.

Dulux was developed several years ago by du Pont chemists. But it was secretly guarded until it was perfected, tested, retested, and approved in actual service on railway structures and equipment. Side by side with the best orthodox finishes, Dulux was checked for its resistance to every conceivable condition. Dulux-finished metals were immersed in brine, sprayed with salt solutions, exposed to sun, rain, heat, cold, and sulphur fumes. In every case, results showed that the life of Dulux is at least 50% to 100% longer than the present oil and varnish types of finish. They showed that its retention of color and gloss is also greater by 50% to 100%.

In every property DULUX is a distinctive type of finish—an exclusive chemical development of the du Pont Company . . . of one of the finest research and control laboratories in the world.

The tests illustrated here give you at least a glimpse of the potential savings Dulux represents. But the true proportion of its possibilities can be obtained only through a full explanation of this modern miracle. A technical bulletin contains the Dulux story. For your copy, write E. I. du Pont de Nemours & Co., Inc., Dept. P2, 1616 Walnut St., Philadelphia, Pa.; 2100 Elston Ave., Chicago; 351 California St., San Francisco.

DU PONT
REG. U. S. PAT. OFF.

DULUX

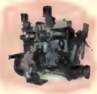
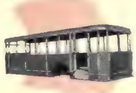
First again

Again in 1930 Yellow Coach sales show a substantial increase over the previous year.

and again Yellow Coach sales lead all other makes.

Yellow's decisive leadership is evidenced by its annual record of engineering advancements and sales performance » »

Back of Yellow's leadership are the many sound contributions it makes each year to the progress of Highway Transportation!

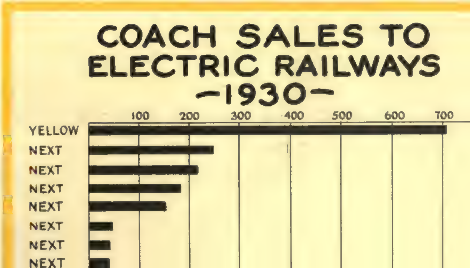
The 250 Parlor Coach. An outstanding achievement in large capacity coach design for cross country service that has set a new standard of passenger comfort, unusual performance and economy of operation. ¶ *The 150 h.p. 616 Engine.*  One of the really great developments of 1930. A powerful engine of extraordinary quietness and flexibility with amazing economy, long life, low maintenance and great reliability. ¶ *The All-Metal Body.*  A great advance in body engineering. Rigid all metal construction, chiefly duralumin. Light weight with amazing strength. Long service life. Low maintenance. ¶ *The Type "Z" 38-40 Passenger City Service Coach.* A great mass transportation vehicle of conventional design with 150 h.p. engine, fast acceleration and ample capacity for meeting peak load conditions. All-metal light weight body. ¶ *The Type "Z" 29-31 Passenger City Service Coach.* An important development resulting in exceptional reliability and service life and a new conception of low cost maintenance. Equipped with the new all-metal light weight body.

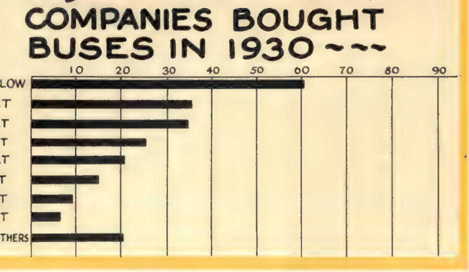
¶ *Type "U."* A complete line of small capacity (16-21 passenger) coaches developed in response to the demand for fast six cylinder coaches of exceptionally sturdy construction and low operating cost. ¶ *The New Series Type "W."* This popular line of small capacity city and parlor coaches powered with a V-Type eight cylinder engine was further improved and refined in 1930.

THE RECOGNITION OF YELLOW LEADERSHIP IS MANIFESTED EACH YEAR BY DECISIVE RECORDS OF OPERATOR PREFERENCE » » » » » »

1929 was one of the biggest years in Yellow Coach history. 1930 was even better. ¶ Year after year more Yellow Coaches are placed in service than any other make. ¶ This marked preference is not limited to any one type of service or class of operator. ¶ More Yellow Coaches are used by the steam railroads than any other make.

¶ *43% of all new busses purchased by the electric railway companies in 1930 were Yellow Coaches. Almost every other coach bought by the electric railways was a Yellow*


COACH SALES TO ELECTRIC RAILWAYS
—1930—



¶ And again in 1930 far more electric railway companies chose Yellow Coaches than any other make. ¶ In cross country service, in small city service and in large metropolitan centers Yellow Coaches predominate by a *wide* margin. ¶ To secure such widespread acceptance the substantial worth and superior earning power of Yellow Coaches had to be proven in competitive service. ¶ The factual evidence of just how satisfactory this performance has been is shown by the records of 1930, when *over 80% of Yellow Coach sales were "repeat" sales* to obviously satisfied users. ¶ Salesmanship may play a part in the initial purchase but repeat orders are placed on the strength of performance and knowledge gained by experience.

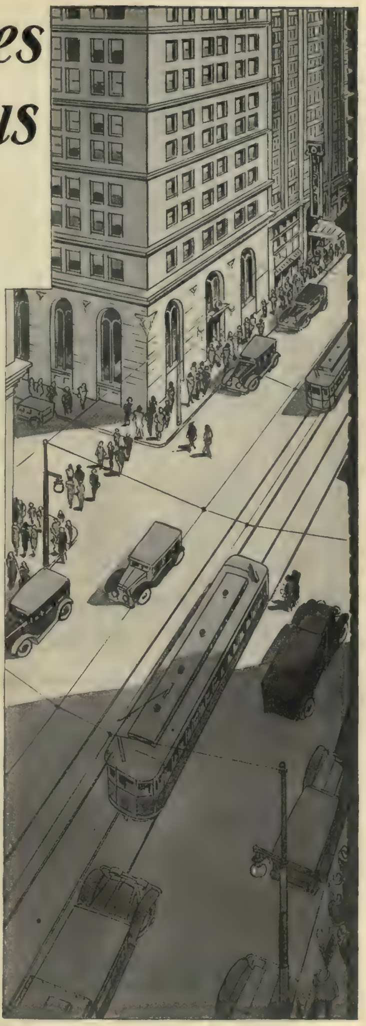
IT CAN BE DONE WITH---

YELLOW COACHES

GENERAL MOTORS TRUCK CO.
Subsidiary of Yellow Truck & Coach Mfg. Co.
PONTIAC, MICH.

YELLOW COACH

Busy Thoroughfares need Inconspicuous Poles that are Substantial



Good appearance is combined with adequate strength in NATIONAL Steel Poles. Good appearance—that the pole may harmonize with the surroundings in which it serves; strength—that the pole may be safe and insure safety of equipment used in connection with it. Neither of these important factors is in any way sacrificed for the other—both are fully regarded. Similarly, every other consideration that rightly governs the choice of line poles is given due weight in "NATIONAL" design and construction.

Made by the largest manufacturer of tubular products in the world. Available in varying designs and dimensions for practically any requirement. Ask for Bulletin No. 14, describing poles made from—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

US STEEL

NATIONAL POLES

Let us again repeat that the *desire* to make a reliable product and the *ability* to do so are combined in the technical personnel and the manufacturing facilities of this organization.

STANDARD PRODUCTS
Steel Axles
Steel Springs
Armature Shafts
Rolled Steel Wheels

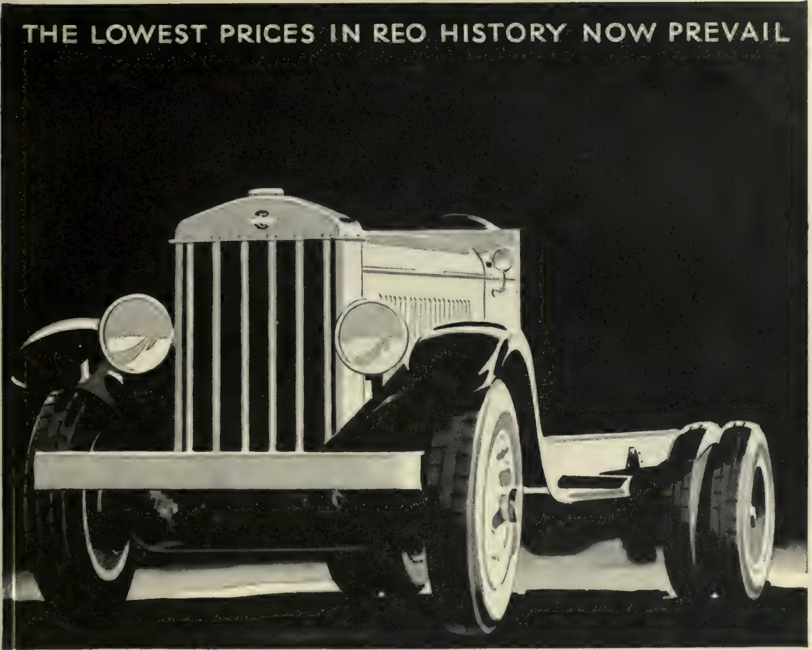
STANDARD STEEL WORKS COMPANY

GENERAL OFFICES AND WORKS: BURNHAM, PA.

CHICAGO
NEW YORK
AKRON

SAN FRANCISCO
PORTLAND

RICHMOND
ST. LOUIS
PHILADELPHIA



REO-

Now Better than Ever!

Bar-protected Radiators
Heavier Fenders
Safety Glass Windshields
Dual Wheel Equipment and 4-speed Transmissions
(Available all Models)
Cowl Lights and New Hardware
Slip-Proof Running Boards
Mud Scrapers
Four Striking Color Options
Modernized Hub Caps
New Upholstery Trim
Extensive Use of Chromium Plate

PRICES—
$895 to $2525
Chassis F.O.B. Lansing, Michigan

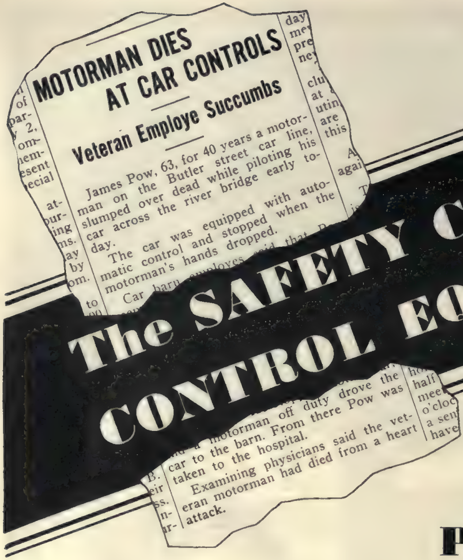
MANY new and exclusive REO refinements, coupled with a record low price on the REO TONNER, have established new high standards of truck value.

Compare REO economy and long life factors—all-day speed on the highways and unrivaled agility in traffic; long-wearing chrome-nickel iron cylinder block and special alloy "Lo-Ex" pistons; REO-designed transmissions; the most effective brakes known to trucking; specially designed frames and springs; magazine oilers!

REO chassis and body combinations meet 95% of all haulage needs. See the latest REO SPEED WAGONS AND TRUCKS. Your REO dealer will gladly show how they will meet your requirements.

REO MOTOR CAR COMPANY, LANSING, MICHIGAN

SPEED WAGONS REO AND TRUCKS



MOTORMAN DIES AT CAR CONTROLS

Veteran Employe Succumbs

James Pow, 63, for 40 years a motorman on the Butler street car line, slumped over dead while piloting his car across the river bridge early today.

The car was equipped with automatic control and stopped when the motorman's hands dropped.

Car barn employes said that P

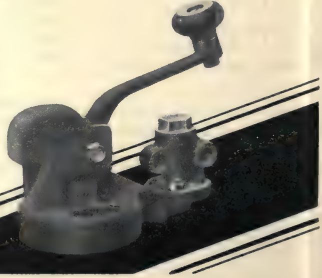
a motorman off duty drove the car to the barn. From there Pow was taken to the hospital.

Examining physicians said the veteran motorman had died from a heart attack.

The SAFETY CAR CONTROL EQUIPMENT

. . . Strikingly Proves Its Value

HERE is an outstanding example of how a distressing incident can be prevented from becoming a disastrous accident . . . The death of this man *might have* entailed injury to others had the car not been equipped with mechanical apparatus designed to safeguard life and property in case of human disability, or even laxity. When the motorman's grip on the controller handle relaxed, this protective apparatus functioned to shut off the power and apply the brakes with full force, automatically . . . Such is the kind of safeguard afforded by modern cars that progressive street railway companies are now using. . . .



SAFETY CAR DEVICES CO.

OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.

CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH

A 16-Track Carhouse Layout by LORAIN

This is another example of LORAIN'S skill and experience in making complicated layouts—and of world-wide recognition.

The 16-track carhouse layout, shown here, was furnished to Ottawa Railways Company, Ottawa, Ontario, Canada. It combines solid manganese and manganese steel insert construction.

Forty years of development enable LORAIN to meet any street railway requirement from the simplest to the most difficult piece of track equipment. When you are specifying rails, joints accessories, switches, mates, frogs, crossing or special track-work . . . when you have problems to solve or quotations to secure—remember, our nearest District Sales Office is at your service.

THE LORAIN STEEL COMPANY, Johnstown, Pa.

Subsidiary of United States Steel Corporation

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL AND WIRE COMPANY
CARNEGIE STEEL COMPANY
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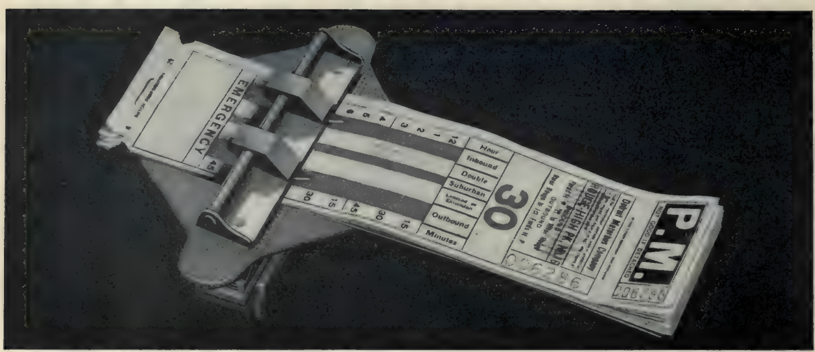
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
ILLINOIS STEEL COMPANY
MINNESOTA STEEL COMPANY
NATIONAL TUBE COMPANY
OIL WELL SUPPLY COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R. R. COMPANY
UNIVERSAL ATLAS CEMENT COMPANY

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

LORAIN SALES OFFICES— Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

This *No Punch* Transfer



MEETS PRESENT DAY TRAFFIC CONDITIONS

. . . ***because*** . . . it eliminates lost time at transfer points; requires no punches; tells at a glance whether time limit has been exceeded, prevents round tripping and other fare abuses;—and results in increased revenue to the company.

Can any transfer do more? We believe not, and so do the 90 or more progressive railway-bus properties who have adopted *similar forms* within a short time.

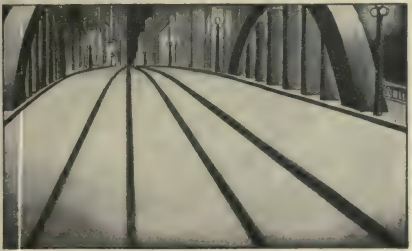
The Hyman cutter as pictured above was especially designed for this style transfer.

Globe
TICKET COMPANY
PHILADELPHIA

Factories:
Philadelphia Los Angeles Boston New York Jacksonville
Sales Offices:
Syracuse Cincinnati Pittsburgh Baltimore Cleveland
St. Louis Des Moines

They selected

CARNEGIE STEEL TIES



.. and insured smooth riding for their patrons

THE BEST MEANS a traction company can employ to overcome automobile competition is to provide a comfortable, uninterrupted ride. Attractive car service removes the incentive for the motorist to provide his own transportation—especially in view of the ever-increasing difficulties of parking. Riding comfort begins with the track. Carnegie Steel Cross Ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort—a track providing long, continuous service. Carnegie Steel Cross Ties will prove a profitable investment — particularly from the standpoint of passenger satisfaction. New booklet on request.

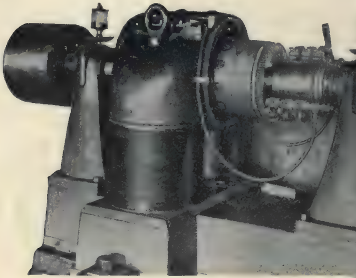
CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

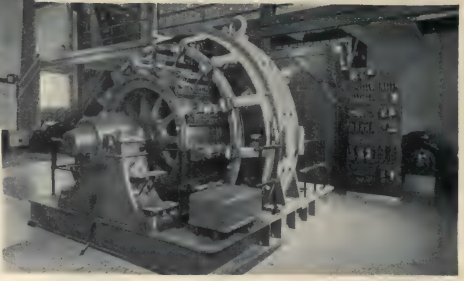
PITTSBURGH, PA.

80

NATIONAL PYRAMID BRUSHES N C C **STANDARD FOR 40 YEARS**



An early electric railway generator, Number 25.



▲▲▲

A 4000 K.W., 650 volt, automatic railway substation.

▲▲▲

Today's Operation Demands Reliability

THE generation and distribution of electrical power today is being removed more and more from the immediate supervision of the operator. That means that every element in the chain of distribution must be dependable. National Pyramid Brushes have proved their reliability under the exacting demands of present operating practice.

When the little railway generator illustrated above supplied the power for the "Toonerville trolley" of its day, the attendant was always near by. As the load changed he shifted the brushes to ease the sparking. The handy sand-paper block and oil pad kept down high mica and softened the noise of the brushes.

Today the automatic substation must function day in and day out without human assistance. It must start when the load demands and shut itself down when no longer needed. Often situated in a residence neighborhood, it must be free from disturbing noise. The commutator must stay right, because several days may intervene between inspections.

National Pyramid Brushes possess the stamina demanded by today's operation. Their superior commutating properties maintain a clean, polished commutator surface. Low friction insures quiet operation. Ample carrying capacity handles heavy overloads with ease. The facilities of National Carbon Company Research Laboratories and the experience of over forty years in carbon brush manufacture assure the uniform quality of National Pyramid Brushes.

CARBON

The peculiar physical and chemical properties of carbon adapt it to many special applications. An electrical conductor, easily formed in special shapes, chemically inert at normal temperature, infusible and, in graphitic form, a good lubricant. Carbon may solve your production problem. Let our engineers advise you.

NATIONAL CARBON COMPANY INC.

Carbon Sales Division • Cleveland, Ohio

Unit of Union Carbide and Carbon Corporation

BRANCH SALES OFFICES: NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO

BUILT FOR HEAVY-DUTY HAULING

Inspection of their powerful engines, alone, quickly proves how sturdy, how modern, how thoroughly "all-truck" Dodge Heavy-Duty Trucks actually are. And beneath the clean-cut, rugged exterior of one of these 96-horsepower engines are full force-feed lubrication, 100-pound crankshaft, 7 bearings, crankcase ventilator, aluminum-alloy pistons and many other features that insure power, dependability, low cost and long life.

• • •

Inspect Dodge Heavy-Duty Trucks—their engines, axles, transmissions, frames, springs. Select the type that fits your needs — payload capacities range from 3,600 to 11,175 pounds. Buy it complete with standard or special body.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING 1½-TON CHASSIS AT **$595**

DEPENDABLE

DODGE HEAVY DUTY TRUCKS

SELF ALIGNING BALL BEARING

DEEP GROOVE BALL BEARING

DOUBLE ROW DEEP GROOVE BALL BEARING

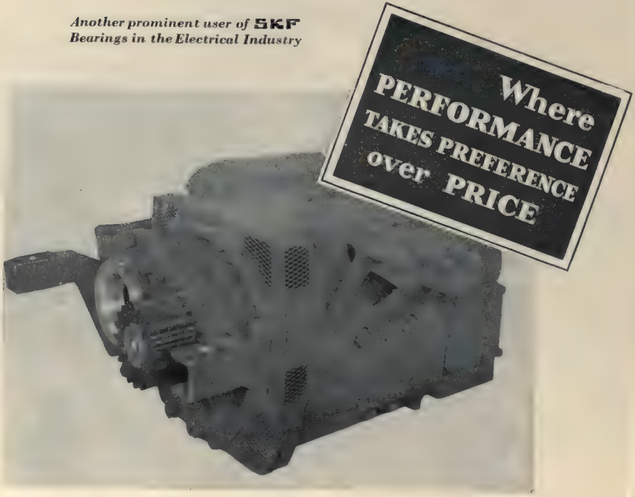
CYLINDRICAL ROLLER BEARING

SPHERICAL ROLLER BEARING

ALIGNING THRUST BEARING

GENERAL ELECTRIC COMPANY

Another prominent user of SKF Bearings in the Electrical Industry



DEPENDABILITY AND SKF ARE A TEAM ON MOTORS

TIME alone is the crucible in which railway equipment must prove itself for . . . dependability and low cost operation. Years of service in the railway field have shown SKF Bearings setting the highest standards of PERFORMANCE wherever they are used.

Smooth, quiet operation is characteristic of General Electric Railway Motors totally equipped with SKF Bearings. Wear is negligible, adjustments are never needed, lubricant is kept where it belongs and moisture excluded. All these features, distinctive of SKF, are factors intensely vital today in maintaining the highest efficiency of rolling stock.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

SKF

2663

Announcing A NEW NATION-WIDE SERVICE PLAN

The name Bendix-Westinghouse, always synonymous with safety and dependability, has now come to mark a service . . . a unique service which promises to carry the effectiveness of the world's most dependable stopping force to even greater heights. Featuring factory reconditioning of automotive air brake devices, this new service plan is handled for the motor transport operator by a nation-wide network of Authorized Bendix-Westinghouse Distributors. Under this new system, compressors or governors, whose efficiency should become impaired through long or abnormal service, are submitted to the local distributor. He in turn diagnoses the trouble, issues a factory reconditioned unit bearing the identical warranty of new equipment and figures the repair costs on a new, low, flat rate basis. The obvious economy of this flat rate system and its elimination of service delays stamps it as a decided forward step in air brake maintenance. As sponsors of this new plan, we should be pleased to give you more detailed information regarding its many advantages. A booklet containing this information, together with a complete list of distributors, authorized to handle the work, will be mailed upon request to the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Pennsylvania.

6285

BENDIX WESTINGHOUSE

AUTOMOTIVE AIR BRAKES

One hundred thousand
pageant of street
welcome quiet street

THE TIMKEN-DETROIT AXLE CO.

people view Detroit's railway progress and cars equipped with » »

TIMKEN *Worm Drive* **TRUCKS**

for electric railway cars

DETROIT, MICHIGAN

YOU HAVE A KEY LIKE THIS

THE key to improvement in business during 1931 is in the hands of industry at this time. It lies in reduction of minor expenses.

Major economies have been studied, checked and rechecked until they have dropped to a highly efficient plane. Now comes the necessity of carefully scrutinizing minor cost items. With these reduced to a sound minimum, it seems reasonable to believe that net profits will reach a more satisfactory level.

Lubrication is one of these minor cost items which responds to study. Not only may direct economies be effected, but through efficient, scientific lubrication methods the unit cost throughout the plant may be reduced.

We have lubrication engineers who can help you ferret out possible reductions in lubrication costs. At your invitation one of these men will go through your plant with you and analyze your lubrication practices. When you finish you will KNOW how efficient your lubrication is. This service does not obligate you in any way . . . and it may be the means of saving many dollars.

STANDARD OIL COMPANY *(Indiana)*
General Offices: 910 South Michigan Ave. Chicago, Illinois

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Cheyenne
Chicago
Davenport
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202-A

LUBRICANTS FOR ALL INDUSTRY

2 + 2 = 4

Dayton Ties + the Dayton Method = Quietness, Smoother riding, Simple Installation, Protection to Concrete, Everlasting tightness, Elimination of Maintenance and Less Cost per mile

PROOF—ASK THE PROPERTY THAT HAS INSTALLED THEM

CLASSROOM LOGIC

Just as surely as two and two make four—Dayton Ties plus the DAYTON METHOD—give you the same uniform result—regardless of your individual problem.

Why not write today for the interesting facts—then make your own comparison. No obligation.

THE DAYTON MECHANICAL TIE CO.
DAYTON, OHIO

SAVE MONEY WITH THE SOCONY 3

1. SOCONY GASOLINES: Banner, proved by popular vote the best gasoline in the non-premium field. Socony Special *plus* Ethyl, long acknowledged the outstanding gasoline in New York and New England in the premium field. In winter we particularly recommend "Special" for bus operation because it's brisker, *livelier!* It gives added power. It lessens gear shifting. It reduces the amount of choke gasoline in your crankcase. It will not knock on the steepest of hills—IT SAVES YOU MONEY.

2. THE NEW SOCONY MOTOR OIL—THE MOST ECONOMICAL MOTOR OIL: It is a completely dewaxed, 100% paraffine base oil which maintains the proper body at all engine temperatures and flows freely in cold weather. It reduces wear in your engine. It gives perfect piston seal, maximum power, minimum gasoline and oil consumption. Proved . . . Perfected—IT SAVES YOU MONEY.

3. SOCONY WINTER GEAR OIL—THE MOST ECONOMICAL COLD WEATHER GEAR LUBRICANT: Don't try to make a *summer* grade of lubricant in your transmission and differential do *winter* duty in gear shifting and gear lubrication. It's a costly experiment! Change to Socony Winter Gear Oil in your transmission and differential—IT SAVES YOU MONEY.

STANDARD OIL COMPANY OF NEW YORK

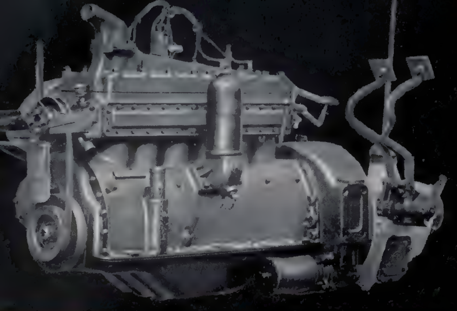
MODEL

BG

THE NEW 21 PASSENGER

Mack

A quality Bus with Mack economy



Six Cylinder, 70 h.p. Engi
. . . 7 bearing crankshaft .
pump mounted integral wi
front cylinder block...sem
automatic battery ignitio
. . . forcefeed and splash l
brication . . . manifold wi
exhaust heat vaporizer.

A QUALITY BUS with MACK ECONOMY

Mack Model BG is especially designed for small capacity service. It is Mack-built throughout — engine, chassis and body — profitable to handle 21-passenger patronage. Yet this small capacity is backed by the same performance characteristics that have established Mack prestige in the larger, heavier buses. It incorporates the best and most modern features of bus construction . . . in short, an ideal small bus for economical, profitable 1931 operation in City Service and for School Work.

The Model BG is also available with a Mack built 17-passenger interurban parlor car body.

MODEL BG BUS
21-PASSENGER CITY SERVICE
17-PASSENGER INTERURBAN

Mack

MODEL BG BUS
21 PASSENGER CITY SERVICE
17 PASSENGER INTERURBAN

MACK MODEL BG

CHASSIS SPECIFICATIONS:

ENGINE: Six cylinder, 3⅝" x 5" 70 H.P. Semi-automatic battery ignition. Force feed and splash lubrication with oil cleaner. Gasoline feed by vacuum tank with venturi booster. Manifold equipped with exhaust heat vaporizer. Air cleaner. Crank case breather into carburetor. Vibration damper on the seven-bearing crank-shaft.

CLUTCH and TRANSMISSION: Mack clutch and transmission mounted integral with engine, four speeds forward and one reverse.

FRONT AXLE: I Beam, reversed Elliot type, heat treated steel.

STEERING: Screw, nut and lever type steering gear of varying ratio. Steering wheel, 20" diameter.

REAR AXLE: Heat treated pressed steel banjo. Cast steel spiral bevel gear carrier with ball bearing and Timken bearing mounted gears. Full floating type axle.

BRAKES: Service, on four wheels, internal expanding. Operated mechanically, and through B-K vacuum booster. Gun iron drums. Hand Brake on drive shaft. Cast steel drum.

FRAME: Manganese steel, heat treated 9/32" thick, 7 3/16" maximum depth and 3" maximum width of flange. Bottle neck at front.

SPRINGS: Front, 11 leaves, 44" long, 2½" wide. Rear, 15 leaves, 54" long, 3" wide. Rubber shock insulator mounting throughout.

EXHAUST: Mack standard muffler located inside of frame.

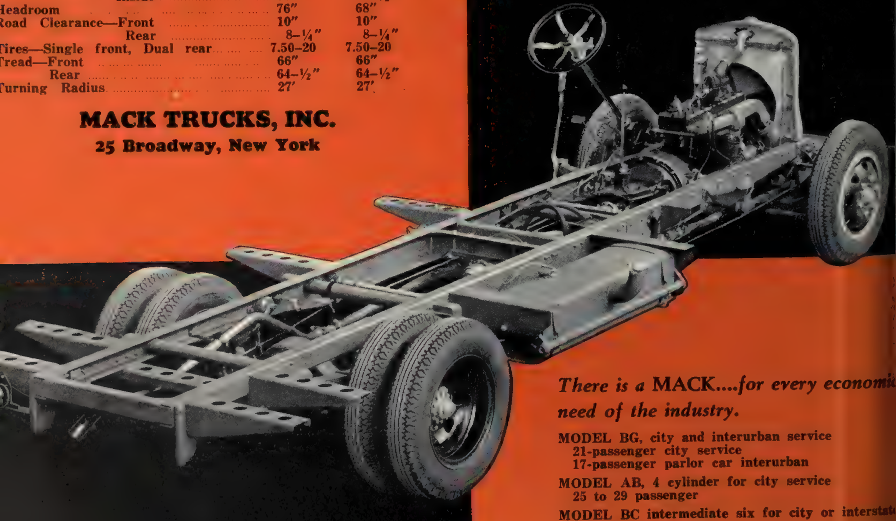
GAS TANK: Forty gallon capacity with fast filling spout. Electric gasoline gauge on instrument board.

HEATING: One hot water heater, mounted at the dash sheet.

GENERAL DIMENSIONS

Passenger capacity	21	17
Wheelbase	183"	183"
Length Overall	23'-8-⅜"	23'-8-⅜"
Body Overhang	62"	62"
Length over Body	212-⅞"	212-⅞"
Width at Belt—Outside	93"	82-½"
Inside	87"	76-½"
Headroom	76"	68"
Road Clearance—Front	10"	10"
Rear	8-¼"	8-¼"
Tires—Single front, Dual rear	7.50-20	7.50-20
Tread—Front	66"	66"
Rear	64-½"	64-½"
Turning Radius	27'	27'

MACK TRUCKS, INC.
25 Broadway, New York



There is a MACK....for every economic need of the industry.

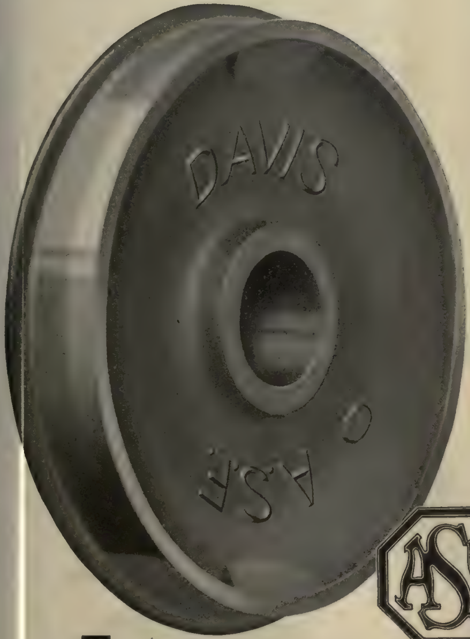
MODEL BG, city and interurban service
  21-passenger city service
  17-passenger parlor car interurban

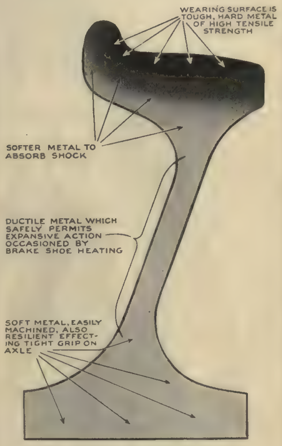
MODEL AB, 4 cylinder for city service
  25 to 29 passenger

MODEL BC intermediate six for city or interstate service
  29-33 passenger for city service
  25-29 passenger interstate

MODEL BK 6 cylinder city or interstate service

Meeting Conflicting Requirements




WEARING SURFACE IS TOUGH, HARD METAL OF HIGH TENSILE STRENGTH
SOFTER METAL TO ABSORB SHOCK
DUCTILE METAL WHICH SAFELY PERMITS EXPANSIVE ACTION OCCASIONED BY BRAKE SHOE HEATING
SOFT METAL, EASILY MACHINED, ALSO RESILIENT EFFECTING TIGHT GRIP ON AXLE

A proper distribution of required physical properties

THE tread and the hub of a wheel won't agree as to what constitutes good material. One wants hardness and wear resistance, and the other wants ductility and shock resistance. To reconcile these opposing views and develop precisely the qualities needed in each part is the purpose of the special heat-treated composition of the Davis "One-Wear" Steel Wheel. Only such a special material can develop the unusual characteristics that make a steel wheel truly "One-Wear."

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

The
METAL & THERMIT

120 Broadway, New York, N. Y.

Pittsburgn Chicago Albany So. San Francisco Toronto

"Won't we be operating 10 years from now?"

THAT'S the question which every perplexed engineering department should ask when the management hesitates to spend money enough to maintain its track properly.

Patching joints may be the cheapest thing for the moment. But it is the most costly treatment over a period of five to ten years. Nowadays when business conditions require that every expenditure be scrutinized most carefully, only those outlays which promise some permanent improvement are really justified.

One worn or broken joint becomes a tiny source of almost continuous trouble. When multiplied by hundreds, such bad joints eat a substantial hole in the possible profits of any company.

Even the crudest repair job involves time and money to send the men out with their tools, to dig up the paving and replace it again. Such a job starts to disintegrate almost as soon as the first car passes over it. Experience shows that two or three years is the usual limit of such patch work, even under light traffic. Under the usual traffic in city streets, some of them are ready for the repair crew again in less than a year. . . . These are merely facts which your own experience has shown.

Thermit welding offers a permanent repair at only a trifle more total cost than patching. Don't merely compare the cost of the Thermit itself. Figure in the total expense of each repair job and see how slight the difference is. Remember, too, that even an old piece of track, Thermit-welded throughout, will give a long, repair-free life until the rail head itself is worn to the limit.

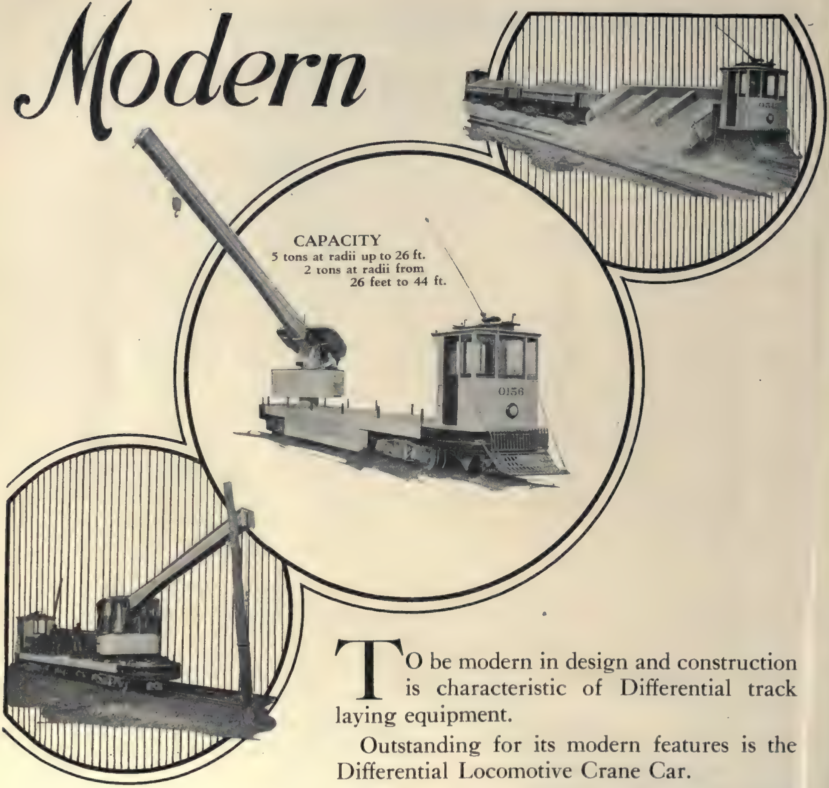
This welding process and the material offered by the Metal & Thermit Corporation is the result of twenty-five years' experience in this field. It is a well-known accepted process, standard on hundreds of electric railway properties, as well as in other branches of industry.

Here then, is a reasonable, economical, and justified program for the New Year —Thermit-Welding for all repair jobs as well as for any new rail which may be laid.

CORPORATION

120 Broadway, New York, N. Y.

P ttsburgh Chicago Albany So. San Francisco Toronto



Modern

TO be modern in design and construction is characteristic of Differential track laying equipment.

Outstanding for its modern features is the Differential Locomotive Crane Car.

One man, from a revolving turret, controls the crane for any loading or unloading operation, for handling rails and bridge timbers, pole setting or special track work.

The Differential Crane is fast, conforms to Electric Railway clearances, does not impede traffic on adjacent tracks.

Equally modern are Differential Dump Cars, Differential 3-Way Dump Trucks and Clark Concrete Breakers.

Comparative cost records of representative Electric Railways prove that Differential modern equipment substantially reduces track laying costs.

THE
DIFFERENTIAL
STEEL CAR
COMPANY

FINDLAY, OHIO

The Alloy Crews ➶ ➶ ➶ Guardians of Quality

The alloy crews of Illinois Steel Company have a free hand in selecting the pick of the furnaces. Special mills and the best of everything are available for their use. Sure in their technique, exacting in their demands, the alloy crews are the best assurance of quality in Illinois Alloy Steels.

Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION
208 South La Salle Street, Chicago, Ill.

US STEEL

ILLINOIS *alloy* STEEL

Carey Elastite

RAIL
FILLER

Protects Paving
Reduces Maintenance
Lessens Noise

Tracks in which Carey Elastite Rail Filler is installed cost less to maintain. This is an unanswerable argument for its use, particularly now, when rigid maintenance economy is necessary. Representative installations in all parts of the country prove that Elastite Rail Filler largely eliminates paving "kick-ups" next to rails.

Carey Rail Filler is performed to fit any type rail, insuring quick and easy application. The tough asphalt composition is not affected by moisture or temperature changes. If you are laying any trackage in paved streets, write for prices and full information, stating rail weight and type.

THE PHILIP CAREY COMPANY, *Lockland,* Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
ROOF PAINTS

Carey
PRODUCTS
EST. 1873

HEAT INSULATIONS
ASBESTOS MATERIALS
CAREYSTONE CORRUGATED SIDING
ASFALTSLATE SHINGLES
BUILDING PAPERS

BOURKE-
WHITE
PHOTO

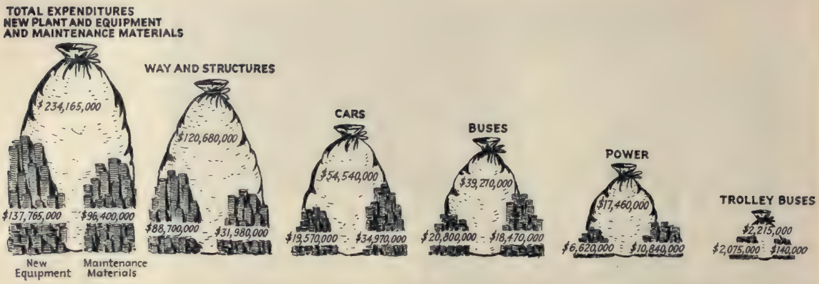
Use the EMPIRE Bolt Planning Service

MACHINE designers, purchasing agents and shop men are invited to use the R B & W staff's engineering facil ies for guidance in specifying the various types and sizes of olts and nuts they use. In the many years we have been m king EMPIRE nuts and bolts for America's premier indu tries, we have assembled a wealth of technical data on th relative strength and strain resistance of the various bolts no v in popular use.

mportant savings of time and money have been effected by many large corporations following analysis of their requirements by our engineers. In many cases, we have shown where special bolts could be replaced with standard bolts, and the number of sizes used considerably reduced. This technical service is available without charge or obligation. We should be glad to review your present bolt and nut specifications and to make suggestions based on scientific knowledge and a wide range of practical experience. Your request, addressed to our nearest office, will bring you the full particulars.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.
PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.
Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

BOLTS EMPIRE NUTS RIVETS



THE 1931 BUDGET—

$13,515,000
HIGHER THAN LAST YEAR

ELECTRIC RAILWAYS are budgeted to spend $352,650,000 this year—the largest budget of any year with the single exception of 1929.

Of this total, $234,165,000 is earmarked for new equipment and maintenance—$96,400,000 for maintenance materials alone.

How will this huge sum be spent?

What innovations and developments in maintenance methods and materials has the past year produced?

What are the current trends in new construction?

These are matters that will be interestingly and authoritatively treated in the Annual Maintenance Number (April) of ELECTRIC RAILWAY JOURNAL—an issue full of practical, helpful facts for every executive concerned with spending a part of the 1931 budget.

ADVERTISERS: The Maintenance Number is read and referred to when purchases are uppermost in the reader's consideration. Forms close MARCH 20.

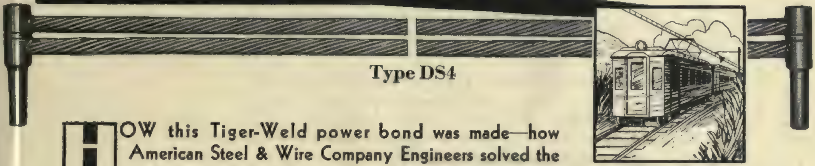
THE ANNUAL MAINTENANCE NUMBER OF

ELECTRIC RAILWAY JOURNAL

APRIL ISSUE

Advertising forms close March 20

NOW.. a new Power Bond with Strength to Spare ..Yet Capable of Carrying Necessary Current Loads..



Type DS4

Look for the Double Ring Mark in the center of the Terminal Head. It is a sign of Superior Quality and Workmanship.

HOW this Tiger-Weld power bond was made—how American Steel & Wire Company Engineers solved the problem of strength—without sacrificing the ability to carry necessary current—is a story of achievement that you will want to know about in detail. Especially so—since its inception means increased efficiency and lower operating costs. It will pay you to write for interesting literature and detailed information.

Designed for use on multi-tracked A. C. systems. The Pennsylvania Railroad adopted Type DS-4 Bonds for all A. C. Electrified Territory.

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AMERICAN STEEL & WIRE COMPANY

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That's the message flashed motorists by the Nachod Turn Right Signal ... preventing serious side-swiping accidents ... saving life and property. No law suits filed ... no damages for the Railway Company to pay. Play safe. Install these ever vigilant automatic watchmen wherever street cars turn unexpectedly. Quotations Gladly Furnished on Request. Nachod & United States Signal Co., Inc., Louisville, Ky., Manufacturers of Block and Highway Crossing Signals.

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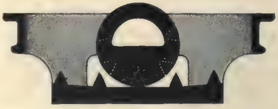

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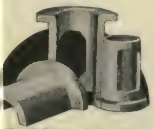
Our specialists will be glad to confer with you and help you solve those problems.

“More-Jones” Trolley Wheels and Harps



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No longer are roads forced to accept crossings developed by "cut and try" methods;...without exact knowledge of the stresses and strains imposed in service, and the proper design to resist them.

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July 6, 1926

No. 1591706

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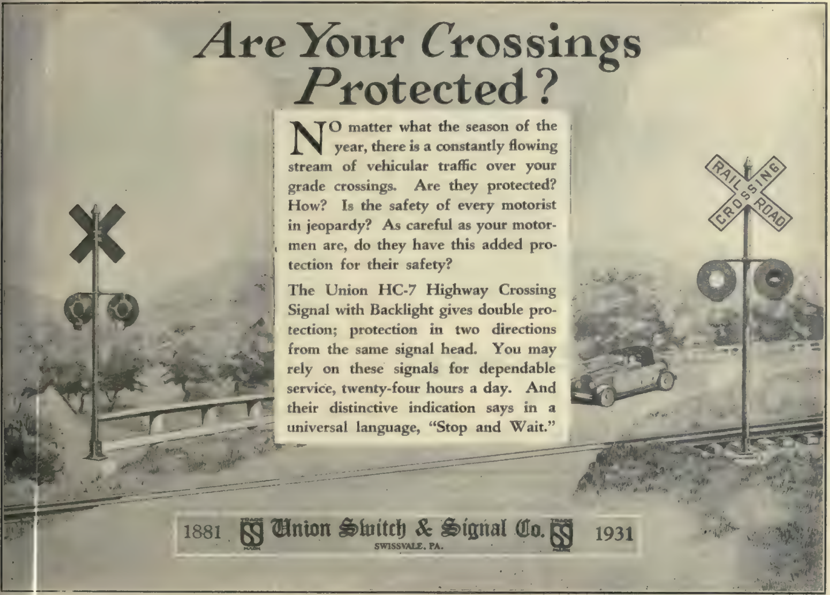

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1881 **Union Switch & Signal Co.** 1931
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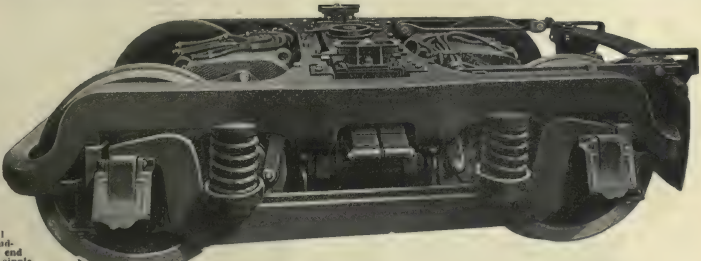

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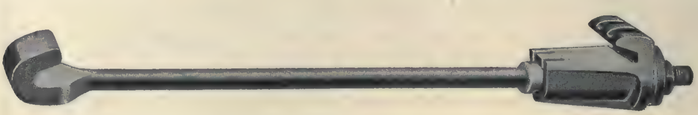
Saves Ties and Labor **Hold Your Track To Gauge**



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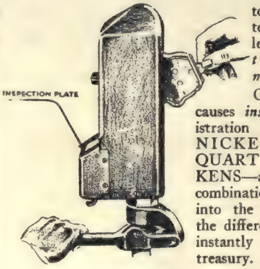
LOUISVILLE FROG, SWITCH & SIGNAL CO.

Louisville, Kentucky

Fare Collection,

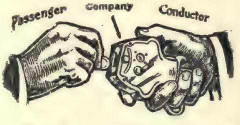


to avoid the old temptations and leaks, *necessitates the coin-slot mechanism.*

Coin - insertion causes *instantaneous* registration *by the patrons.* NICKELS, DIMES, QUARTERS, or TOKENS—all or in various combinations, are paid into the *one* coin-slot—the different values being instantly assured your treasury.

MONEY METERS are furnished in either *portable* or *stationary* form and are mechanically unbeatable for trolleys and buses.

This *at-the-source* protection will probably add 4% to 10% to your present passenger income.



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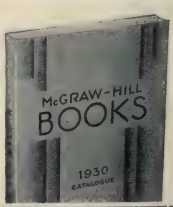

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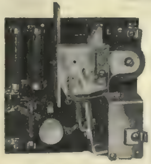

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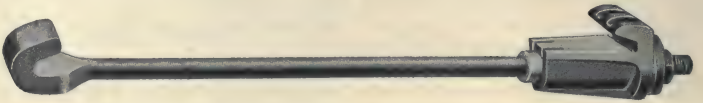

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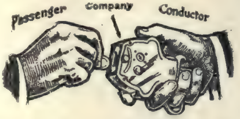

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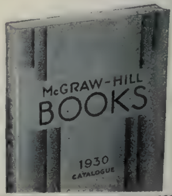

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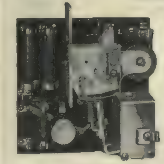

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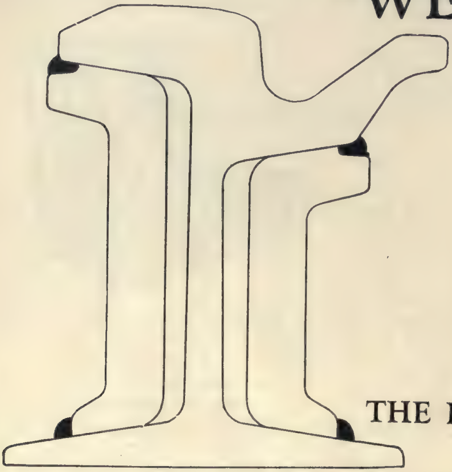

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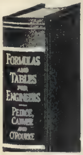
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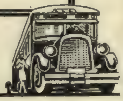

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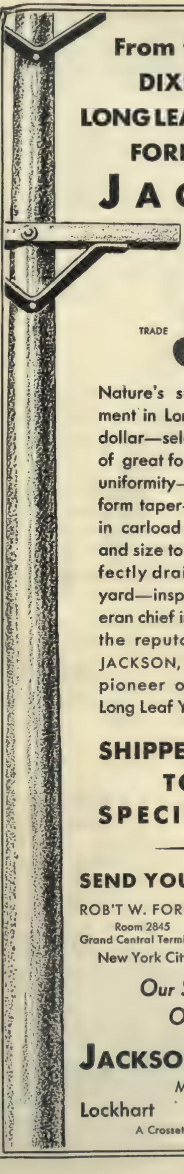

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UNDISPLAYED—RATE PER WORD:

Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 inch	$6.00
2 to 3 inches	5.75 an inch
4 to 7 inches	5.50 an inch

Other spaces and contract rates on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. R.J.

COPY FOR NEW ADVERTISEMENTS ACCEPTED UNTIL 3 P. M. ON THE 20TH FOR THE ISSUE OUT THE FIRST OF THE FOLLOWING MONTH

POSITIONS WANTED

ARMATURE winder, well experienced with railway equipment, desires change. References. Go anywhere. PW-238, Electric Railway Journal, 883 Mission St., San Francisco, Cal.

SUPERINTENDENT transportation, with successful record, high-class references, now engaged, desires making a change. Salary, location, secondary importance. PW-239, Electric Railway Journal, Tenth Ave. at 36th St., New York.

RAILWAY manager and superintendent, familiar with all phases of modern operation of electric cars and buses, desires position. Through excellent references a successful record of handling labor and reducing maintenance and operating costs will be disclosed. Any reasonable proposition in any location will be considered. Please reply to PW-240, Electric Railway Journal, Tenth Ave. at 36th St., New York.

FOR SALE

Economy Power Saving Meters

in good operating condition: 100, 150, and 200 ampere. Price very low. Communicate with

THE MILWAUKEE ELECTRIC RAILWAY AND LIGHT COMPANY
Public Service Bldg., Milwaukee, Wisconsin

DISMANTLING?

Let us handle this for you. We specialize in buying and dismantling entire railroads, street railways, industrial and public service properties which have ceased operation. We furnish expert appraisals on all such properties.

Consult us also about New and Relaying Rails—all weights and sections. You will like our service.

The Perry, Buxton, Doane Company
(Capital $1,000,000.00)
Boston Office, P. O. Box 5253, Boston, Mass.
Pacific Sales Office—Failing Building, Portland, Oregon

Saving is a good habit, BUT—

Why Save Things You'll Never Use?

WHY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Tomorrow they will be—JUNK. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department
ELECTRIC RAILWAY JOURNAL
Tenth Ave. at 36th St., New York, N. Y.

Don't throw away waste and wiping cloths!

NO matter how grimy and oil-soaked waste and wiping cloths may be, you can reclaim them at a fraction of the cost of replacing them. And in addition, these washed cloths will be softer and more absorbent than new.

As for example a Pacific Coast road finds reclaiming cloths the Oakite way so economical that they now wash out printed and painted advertising banners which have been displayed on the sides of their cars. The rags obtained are re-used for window washing and similar purposes.

It will pay you to investigate this and other Oakite money-saving methods. Write and ask to have our nearest Service Man give you more information. No obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the United States and Canada.

Manufactured only by
OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG U S PAT. OFF.
Industrial Cleaning Materials and Methods

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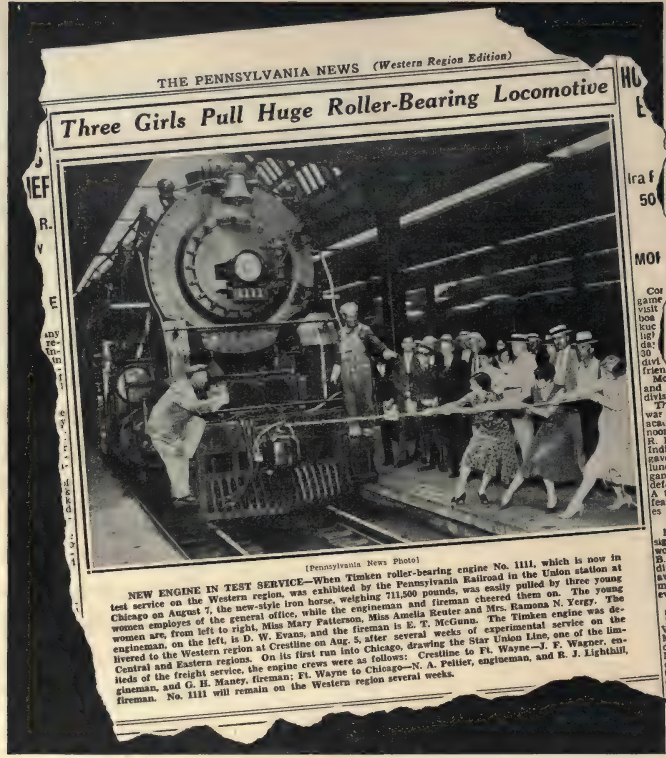
Are you up-to-date on trolley shoe progress — — ?

Operating men who have dug deeply into our latest developments go so far as to say all electric surface cars will be trolley shoe equipped in three years — we do know there is a mighty gratifying interest right NOW in — —

·IONLOYD·
Reversible
Trolley Shoes

When can we talk it over?

EFFICIENCY PRODUCTION CORP.
1203 Barlum Tower, Detroit, Mich.



THE PENNSYLVANIA NEWS *(Western Region Edition)*

Three Girls Pull Huge Roller-Bearing Locomotive

[Pennsylvania News Photo]

NEW ENGINE IN TEST SERVICE—When Timken roller-bearing engine No. 1111, which is now in test service on the Western region, was exhibited by the Pennsylvania Railroad in the Union station at Chicago on August 7, the new-style iron horse, weighing 711,500 pounds, was easily pulled by three young women employes of the general office, while the engineman and fireman cheered them on. The young women are, from left to right, Miss Mary Patterson, Miss Amelia Reuter and Mrs. Ramona N. Yergy. The engineman, on the left, is D. W. Evans, and the fireman is E. T. McGunn. The Timken engine was delivered to the Western region at Crestline on Aug. 5, after several weeks of experimental service on the Central and Eastern regions. On its first run into Chicago, drawing the Star Union Line, one of the limiteds of the freight service, the engine crews were as follows: Crestline to Ft. Wayne—J. F. Wagner, engineman, and G. H. Maney, fireman; Ft. Wayne to Chicago—N. A. Peltier, engineman, and R. J. Lighthill, fireman. No. 1111 will remain on the Western region several weeks.

You Need This Anti-Friction Efficiency In Your Cars

Can you imagine any more convincing demonstration of the value of Timken Tapered Roller Bearings in modern railroad and electric car service?

The above picture and account of this interesting test are reproduced from The Pennsylvania News (Western Region Edition) of August 15, 1930, by permission of The Pennsylvania Railroad Company.

The Timken locomotive is the first engine to be completely equipped with anti-friction bearings on all axles—front truck, drivers, trailer truck and tender trucks.

Just consider what such frictionless performance would mean in your cars—in reduced starting effort; in lower power demands; in lubrication economy; in smoother, joltless riding; *in longer wheel life.*

169 electric and steam lines are now operating Timken Bearing Equipped rolling stock. Don't you want Timken benefits in your equipment? The Timken Roller Bearing Co., Canton, Ohio.

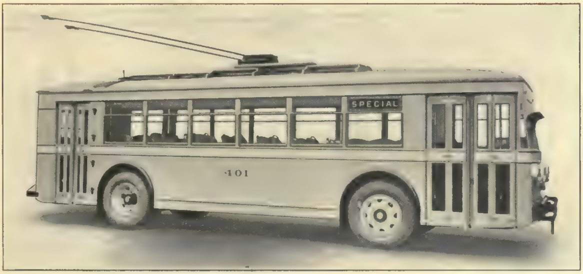
TIMKEN *Tapered Roller* BEARINGS

Consider these points—

1. Excellent riding qualities
2. Approved type axles
3. Adequate tire capacity
4. Practical 60-40 load distribution
5. "Long life" pier type construction
6. Adequate ventilation
7. Durability and accessibility in equipment installation

and you will select—

Brill Trolley Buses



40-passenger type operated in Chicago and Rockford

THE J. G. BRILL COMPANY
PHILADELPHIA
CHICAGO OFFICE - HARRIS TRUST BUILDING
SAN FRANCISCO OFFICE - RIALTO BUILDING
THE J. G. BRILL COMPANY OF OHIO - CLEVELAND
THE J. G. BRILL COMPANY OF MISSOURI - ST. LOUIS
THE J. G. BRILL COMPANY OF MASSACHUSETTS - SPRINGFIELD

HOUSTON
TEXAS

World's Largest Operator *uses Trolley Coaches equipped with*

HASKELITE and PLYMETL

THE Chicago Surface Lines has in service more trolley coaches than any other operator in the world. A large majority of these vehicles—74 in all—have HASKELITE or PLYMETL, or both, in their construction.

One of the economic factors that is pushing trolley coaches to the front in electric railway service is the light weight of these rugged, serviceable bodies. Dead weight in roof and body panels is reduced to a minimum by taking advantage of the structural strength of HASKELITE and PLYMETL.

Bodies built with HASKELITE and PLYMETL are safe, rugged, and strong. These panels have greater strength and resistance to impact than any other material of the same weight.

A Haskelite engineer will gladly show you the correct application of HASKELITE and PLYMETL in any bodies you are considering.

PLYWOOD
HASKELITE
PLYMETL

HASKELITE MANUFACTURING CORPORATION
120 South LaSalle St., Chicago, Ill.
In Canada: Railway & Power Engineering Corp., Ltd.

PLYWOOD
HASKELITE
PLYMETL

ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc. MARCH, 1931 Thirty-five Cents Per Copy

CAN YOU TELL TWINS APART

No Sir!—The 1927 Twin Coaches look exactly like those of 1931.

Twin Coach equipment for this year conforms to the same basic design and appearance as were established four years ago.

Only in standardization of this kind do we believe it is possible for the manufacturer to provide you with a seasoned, "cleaned-up" vehicle, requiring a minimum of maintenance.

Twin Coach
BY F.R.FAGEOL KENT, OHIO

Single motor, 21-24 passenger type of Twin Coach permitting comfortable peak hour capacity of fifty persons.

VA CONTROL

- - - meets every demand for the speed and safety of today's city transportation by—

- Smooth Rapid Acceleration
- Quick Response
- Effective Notching
- Hand or Foot Operation
- Emergency Dynamic Braking
- Simplicity and Reliability

Modern city car of the United Railways & Electric Company (Baltimore) equipped with Westinghouse High-Speed Motors, W-N Drive and VA Control.

In recent months Westinghouse Variable Automatic Control has been placed in operation on the following properties:

- Montreal Tramways Co.
- Brooklyn and Queens Transit Corp.
- United Railways and Electric Company of Baltimore
- City of Detroit, Dept. of Street Railways
- Chicago Surface Lines
- Los Angeles Railway Corp.
- New Orleans Public Service, Inc.
- Lehigh Valley Transit Company
- Pittsburgh Railways Company

Modern trolley bus of the Chicago Surface Lines equipped with Westinghouse High-Speed Motors and VA Control.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T 31727

TUNE IN THE WESTINGHOUSE PROGRAM OVER KDKA AND A NATION-WIDE N.B.C. NETWORK EVERY TUESDAY EVENING.

ELECTRIC RAILWAY JOURNAL

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

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Next Month

The Annual Maintenance and Construction Number

will contain a variety of articles discussing equipment and practices of electric railways in maintaining rolling stock, track, overhead lines, trolley buses and motor buses

ALSO

Securing the Co-operation of the Employee

By E. K. Hall

and an

Announcement Concerning Company Maintenance Contest

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1931

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CLEVELAND, *Guardian Building*
BOSTON, *1427 Statler Building*
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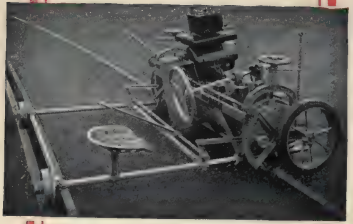
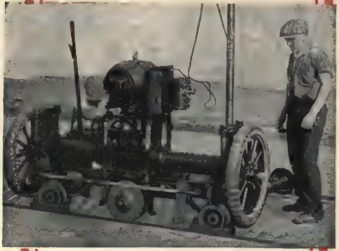
LOS ANGELES, *632 Chamber of Commerce Bldg.*
LONDON, *6 Bouverie Street, London, E. C. 4*

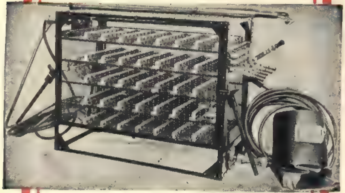


Improved Atlas Rail Grinder

Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

You don't treat
the public
rough
but how about
your rails?

In your public relations, you wisely avoid jarring your customers.

How about your rail?

Even your best cars cannot content riders if your rails are corrugated, your joints cupped and your special work battered.

What's more, the potential economies of new car operation are soon dissipated by increased maintenance attributable to rough track.

To that add progressive track deterioration accelerated by neglected rail maintenance.

To maintain good will, to preserve traffic and minimize maintenance, rail grinding by modern methods has no substitute.

Here are modern tools for economical rail maintenance.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
H. F. McDermott, 208 S. La Salle St., Chicago
F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

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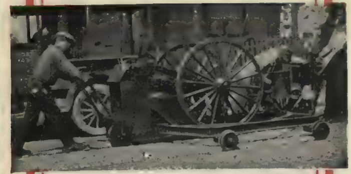
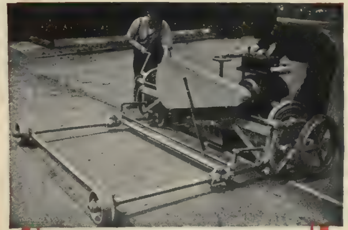
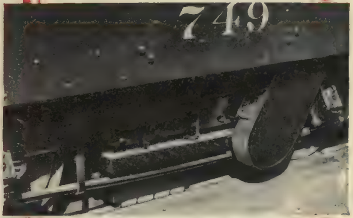


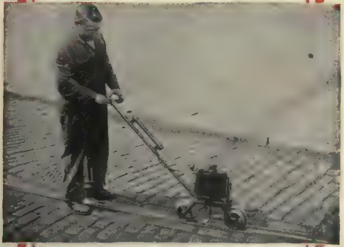
Reciprocating Track Grinder



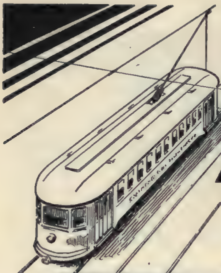
Vulcan Rail Grinder



Reciprocating Grinder Car, showing one of the grinding units.



RTW Curve Oiler



SOUTHERN PROPERTY salvages $230,502 from MAINTENANCE COSTS

Improved Marathon Ears
Spring Lock Hanger
Duplex Trolley Frogs
Feeder Dead-End Clamps
O-B Insulated Approach
National Trolley Guard

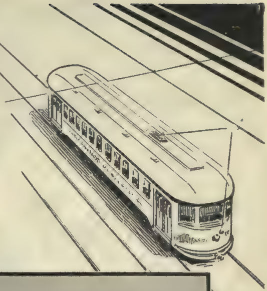
A PROMINENT electric railway property in the south showed total revenue of $5,134,918 and a net profit of $321,294 in 1925. In 1929 the same property showed total revenues of $5,233,609 and net profits of $1,607,167—an increase of $109,309 in revenue, but an increase of $1,279,873 in profits. The answer is that operating costs were reduced $1,187,182. Of this reduction, $230,502 was salvaged from what proved to be excessive maintenance costs.

Such a reduction of operating costs, while startling in its total, is not impossible. Most frequently it is accomplished by greater attention to the small wastes; by getting a few thousand additional car passes from each ear; by using hangers that reduce wear on every wheel and every ear; by using frogs of longer service life and of more positive operation; by saving labor on every section insulator, dead-end, span wire clamp which is put up in a year; by utilizing devices that protect high priced materials against quick deterioration—pole sleeves, trolley armor, etc.,—these are a few of the items by which the flow of money is most frequently directed from operating costs to net profits.

The property referred to above is an almost, but not entirely, 100% user of O-B line materials. However, it has indeed demonstrated the profit-growing results of standardizing on O-B Marathon Ears, O-B Spring-Lock Hangers, O-B Frogs, O-B Cross-Overs, O-B Type C Splicers, O-B Strain Insulators, O-B Section Insulators and other O-B material of like economical advantages.

When planning your Spring attack to remedy the ravages of time, to annihilate waste, to reduce operating costs; plan to replace, not merely with new material, but with O-B material—material that will put operating costs on a diet and fatten your purse with profits.

O-B CATCHERS and RETRIEVERS help o build up PROFITS!

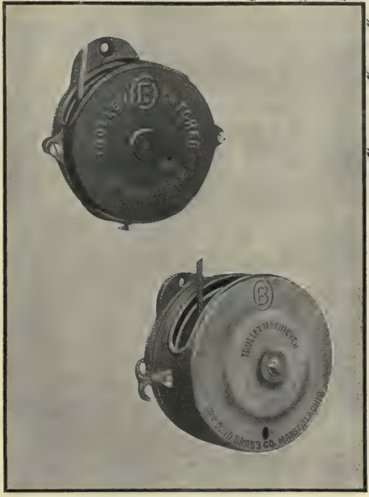


ALL trolley catchers and retrievers wear out. The important difference, the difference that determines the relative economy of the equipment, is that some wear out two or three years sooner than others. And two or three years subtracted from the standard service life—a standard which has been set by O-B Catchers and Retrievers on properties the world over—adds from ten to twenty per cent to the cost of equipment; a cost which is directly deducted from net profits.

The reasons for the long service of O-B Catchers and Retrievers lie in the simplicity, the accuracy, and the strength of every detail of design and construction. Both devices are made with few parts; the minimum that will insure positive, automatic operation. These parts are accurately machined on jigs to provide interchangeability. All materials are sufficiently sturdy to insure a factor of safety in excess of the severest requirements. Springs are of proper design, rugged Flecto malleable iron castings of generous weight, convenient accessibility for oiling—these characteristics are the essentials of low maintenance and long life, and are liberally provided in O-B Catchers and Retrievers.

Make it a point to check service records before specifying your next trolley catcher equipment. If the result establishes the conviction that O-B Catchers and Retrievers are the most economical to use because of greater strength and longer life, a new opportunity will be presented for increasing profits by decreasing operating expense.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Company, Limited
Niagara Falls, Canada
1373CL



The O-B Trolley Catcher *quickly and positively catches and holds a flying trolley pole without "stepping up". Regardless of the rebound of the pole and resultant slack rope, it does not let go. Requires lubrication only at long intervals.*

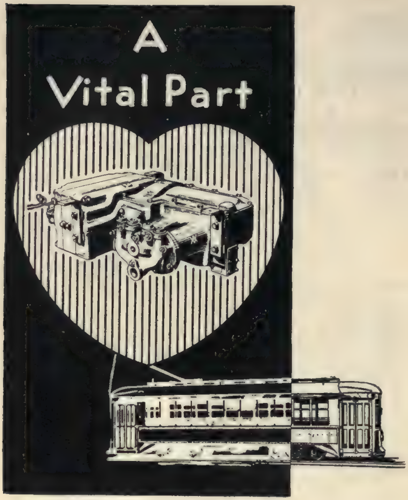
The O-B Retriever *quickly stops and pulls down a flying pole clear of the overhead. It is positive and powerful enough to overcome the heaviest trolley rope tension. It is your assurance against broken trolley poles and a damaged overhead.*

A copy of O-B New Products Supplement No. 4 will be sent upon request.

Ohio Brass Co.

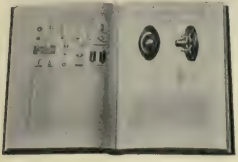
PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

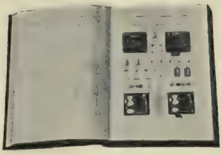
NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

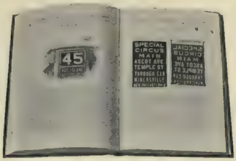


The air compressor is an integral part of every air brake equipment—and VITAL . . . Just as the heart functions to pump life blood through a human organism so does the compressor provide vital "fluid" for actuating the brake . . . Westinghouse compressors have no "organic" defect, require only reasonable attention to avert "functional" trouble, and, if kept in normal health, will need no "doctoring" to assure a long and useful life . . . The DH Compressor, built in four sizes, 10, 16, 20, and 25 cu. ft., displacement is noted for its compact design, light weight, accessibility, and dependable performance . . . For extremely light weight requirements, compressors made of aluminum are available . . . WESTINGHOUSE TRACTION BRAKE CO., General Office and Works, Wilmerding, Pa. » » » » » »

WESTINGHOUSE TRACTION BRAKES







OPEN UP OUR CATALOG NO. 7 . . .

KEYSTONE CAR EQUIPMENT

Keystone Equipped Trolley Bus, built at American Plant of J. G. Brill Co.

—just as good for Trolley Buses!

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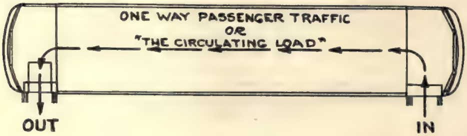

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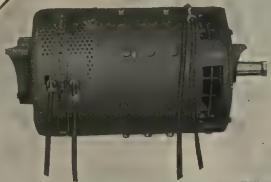
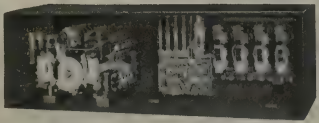


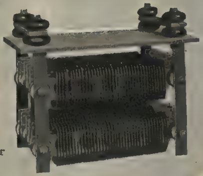
GF-1154 motor (50 hp.)

GE-1126 motor(35 hp.)



PCM automatic multipoint control for trolley buses

Type CP compressor for trolley buses



Type EW resistor

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330-161

GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

New York,
March, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 3

Watchful Waiting or Constructive Action

WHENEVER a business concern or an industry finds itself in an unsatisfactory situation, it can follow either one of two courses. It can sit back and wait for things to work themselves out, or it can set to work actively to do whatever is possible to correct the situation. Where an individual or a single business is concerned, the active course is so obviously the one to follow that no intelligent person would think of doing otherwise. But when the unsatisfactory situation is general throughout all business, there is a marked tendency for everyone to follow the course of waiting for conditions to correct themselves. That conditions will correct themselves eventually is probably true. In the meantime, however, untold suffering and loss are bound to occur.

Business in this country today must choose between these two alternatives. The depression of the past year has been unparalleled in extent and severity. Must we wait for the situation to correct itself, or shall we take active measures to set the wheels going again at normal speed?

Believing that this situation presents a challenge which can be met successfully by the enterprise and co-operative effort of American business men, the McGraw-Hill Publishing Company has developed a platform which it hopes will be helpful in stimulating thought and action. This platform contains four general principles, which may be briefly stated as follows:

1. Established standards of living should be maintained by maintaining high purchasing power.
2. Business growth should be stabilized by long-term planning.
3. Co-operation between business and financial interests in the United States and other countries should be promoted in order to facilitate the normal international movement of goods.
4. Private initiative and responsibility should be encouraged and the activity of government in the field of business should be confined to a minimum.

A more extensive presentation of these principles and the means of putting them into effect is given in a special supplement which is being distributed with this issue of ELECTRIC RAILWAY JOURNAL.

Although certain planks in this platform have direct application to the local transportation industry, it is not so much on that account, but rather because of the interest which this industry has in the general business situation, that the JOURNAL is calling special attention to the program. In times of depression the transportation business suffers along with the rest, although perhaps not to quite the same extent as most others. Any steps which can be taken toward the improvement of the general situation will undoubtedly be of real benefit also to this industry.

This platform is not presented as a panacea for all the economic ills from which the country is now suffering. Undoubtedly there are other effective means of stimulating recovery. But no co-ordinated effort is discernible toward putting them into effect. These broad general principles are proposed, therefore, as a foundation upon which business as a whole, without waiting for the sun to shine more brightly at some unknown future date, can safely begin to build—now.

◆

Wage Reduction Not a Cure for Business Depression

DURING a period of business depression it is only natural that wage reductions should receive consideration as a means of lowering costs. Attractive though such a plan may appear at first glance, critical analysis indicates that its ultimate effect may be harmful rather than beneficial.

General business prosperity depends upon the margin between the income of the average man and the cost of his essential living requirements. The utilization of this margin for the purchase of a wide variety of commodities in the luxury or semi-luxury class is the basis upon which our present business and industrial structure has been built. From 1900 to 1914 the margin between income and cost of living remained practically constant in this country. From 1915 to 1929 wages increased more rapidly than prices, thereby creating a wider margin and consequently greater prosperity.

During the past year a decline in price levels has further increased this margin by about 10 per cent for employed workers whose wages have remained unchanged. It is this increase which advocates of wage reduction believe should be lopped off. But even the recent gain in purchasing power of employed workers has not been sufficient to offset the 20 per cent decrease in purchasing power resulting from extensive unemployment. To reduce the wages of the employed workers at this time would tend to make this condition worse. Moreover, it would be almost sure to create widespread social unrest.

Reduction in wages would, of course, permit the lowering of production costs, but that would avail little if markets were correspondingly restricted because everyone had less money to spend. Nor can we look to export trade as a promising outlet as it was following the business depression of 1921. Foreign purchasing power is now at a low level due to low prices for raw materials, and we are dependent for recovery almost entirely upon an increase in domestic purchasing power.

If it were possible for a single company or a single industry to reduce its wages, while those of all others remained the same, there is no doubt that it would benefit thereby. But if the others all follow the same plan, the benefit is lost. The situation is like that of a spectator at a baseball game who stands up in his place in order better to see the play. For an instant he has an advantage, but as soon as the other spectators stand up his advantage is lost. With wage reductions all around, our industrial machine would no doubt continue to function, but at reduced speed with no advantage to anyone.

▼

Pennsylvania Program Reflects Sound Business

FAR-REACHING in its effects is the decision of the Pennsylvania Railroad, reported elsewhere in this issue, to speed up its construction program announced nearly two years ago. The projects, which are concerned largely with the electrification of the lines between New York and Washington, involve a total expenditure of $175,000,000. According to the new plan they will be completed a year and a half ahead of the original schedule.

While much of the expenditure is for materials, their fabrication involves a great deal of labor, much more than the actual installation work. Production of 150,000 tons of steel, 240 electric locomotives, electrical equipment for 80 cars, the necessary overhead line fittings, substations, power stations and transmission lines, and large quantities of building supplies as well, represent an immense contribution to the relief of unemployment.

Of course, the Pennsylvania itself stands to gain a great deal by the acceleration of it's program. While it undoubtedly will be necessary to do considerable financing to raise such a large amount of capital, the money market is such that it can be done on the most favorable terms in ten years. Labor today is more efficient, and wages are lower, than at any time in the recent past. Then, too, the ability to place the new facilities in full service eighteen months ahead of the date planned will that much sooner bring the financial economies estimated, and will eliminate large sums for interest during construction, or at least while the portion of the plant already installed can be used only to a limited extent. The public will obtain the advantages of the improvements sooner, and that will undoubtedly be reflected in increased revenue.

Altogether, the plan has a great deal of merit. Under the present unsettled business situation, it indicates that the men back of this vast system are convinced of the soundness of transportation and of the rapid recovery of industry. This point of view should do much to make other operators gain courage.

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How Long Is a Mile of Trolley Bus Route?

WITH the recent rapid expansion of trolley bus operation confusion has arisen as to the meaning of the terms used when comparing the extent of these and other transportation facilities. Specifically the question comes to this: What constitutes a mile of trolley bus route?

For many years the electric railway industry was accustomed to measure the extent of its facilities in track-miles. Occasionally the term route-miles was used for certain purposes, but this had no fixed relation to the physical plant and was generally less convenient than the term track-miles.

When motor buses came into general use by the electric railways it was necessary to adopt some method of measuring the extent of the new facilities. There being no physical property in the street, route mileage was selected. Confusion immediately arose. Different companies had various definitions of route mileage. Some divided the round-trip mileage by two and called the result route mileage. Others considered route mileage as the total length of street over which the buses operated, regardless of whether the operation was in two directions or one. While these methods were similar to the methods of measuring electric railway route mileage, neither gave a figure comparable to track-miles. Nevertheless, it has been common practice to treat the two as though they were similar measurements.

Entrance of the trolley bus into the picture has added a new complication. Although there is no track to measure, there is physical property in the street, and both investment and maintenance costs depend on whether there are two sets of overhead wires or only one. Hence route mileage, which considers only the length of street and not whether operation is in two directions or only one, is not an altogether satisfactory method of measuring the extent of trolley bus facilities.

Present practice varies in this matter. Companies following in a general way the practice of considering 1 mile of street to be 1 mile of route include the Utah Light & Traction Company, Salt Lake City; New York State Railways, Rochester; Tennessee Public Service Company, Knoxville; Brooklyn & Queens Transit Corporation; and United Railways & Electric Company, Baltimore. In Philadelphia, New Orleans, Rockford, Detroit and Chicago, a mile of street is considered to be 2 miles of route if operation is in two directions. The first method produces a figure which is comparable to motor bus route mileage, but which disregards the amount of physical plant. The second is a better measure of the size of plant, but gives a figure which is not route mileage in the generally accepted sense of the term.

One possible solution of the problem thus presented would be to measure the mileage of "trolley bus line," considering a single pair of overhead wires as the equivalent of a single railway track. Two pairs of wires would be measured in the same way as double track. If, then, the length of bus route was measured as round-trip mileage, the three figures would be reasonably comparable. In comparing the operations of one property with another, or in discussing the size of the industry, it is necessary to use terms with definite meanings, and it is clearly evident that clarification of the existing situation is urgently needed.

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No End to This Circle

DURING the period from 1914 to 1931 the number of automobiles per mile of surfaced rural highway in the United States rose from 9 to 41. A similar increase occurred in the density of motor vehicles per mile of city street. These facts have been seized upon by the "good roads" protagonists as evidence showing the need for more and wider highways, double-deck streets and other new facilities for the accommodation of motor vehicle traffic. Among automobile manufacturers, too, the theory is widely held that one of the limiting factors in automobile sales is lack of roadway space upon which the owners can operate their vehicles. The manufacturers, therefore, are advocating accelerated street and highway improvement programs.

But this line of reasoning overlooks a very important fact. During the period from 1914 to 1930 when automobile density showed such a remarkable increase, more than $12,000,000,000 was spent on improvement of rural highways, and an approximately equal amount on city streets. Despite these enormous expenditures, street and highway congestion became steadily worse. Bemoaning this situation, a prominent official of the automotive industry recently stated: "Metropolitan traffic may rightly be called a pent-up flood. Whenever new facilities are opened, they are immediately used to their limit at peak-traffic times and there seems to be no falling off in the traffic elsewhere. New traffic facilities create increased traffic so rapidly that congestion follows on the heels of the official dedication of a new highway or boulevard."

The individual automobile owner stands to profit little through plans to increase the capacity of the highways. Through license and gasoline taxes he pays a large part of the cost of highway improvement. Accelerated construction will simply provide room for more vehicles which will pay more gasoline taxes to build more highways for more vehicles, while the level of congestion remains practically constant. Relief is not obtained and the taxpayer is mulcted in a vain search after a will-o'-the-wisp.

The urban traffic problem will be solved only when the public divorces itself from the idea that the desired objective is the movement of vehicles and recognizes that the real object to be sought is the movement of people. Till then we shall simply be traveling in a circle and getting nowhere.

▼

Re-threshing Old Straw

MUCH ado is being made in Brooklyn these days over the operation of one-man cars. As part of its extensive modernization program, the Brooklyn & Queens Transit Corporation has bought several hundred new cars equipped for one-man operation. But this new equipment has not met with favor in the eyes of a certain part of the citizenry.

In an editorial, the Brooklyn *Daily Eagle* recently stated that "street cars operated by one man are an experiment." It might be asked, if the one-man car is an experiment, how it is that 427 railways in the United States and Canada are now operating nearly 23,000 cars of this type?

Extensive consideration was given to this subject by the Transit Commission in 1928, and approval was expressed of one-man operation under proper safeguards. In response to protests recently received, the commission has made another investigation. Reporting on the results of his survey of the situation, the representative of the commission's service bureau declared more cars were running on shorter headway under the one-man system, but that the running time between terminals was longer than when two-man cars operated. He also said there was more frequent service at less cost and pointed out that safety devices have brought about fewer boarding and alighting accidents. One-man service is satisfactory, he said, when the proper type of cars is used and proper headways are maintained under adequate line inspection.

In all of this, there is nothing that has not been known before. Other cities, large and small, have found the one-man car to be a satisfactory and efficient transportation vehicle, but the public of Brooklyn apparently wants to be a law unto itself.

TRANSPORTATION—

The Keystone of Progress

By

DR. JULIUS KLEIN

Assistant Secretary of Commerce

In the same manner that the trunk line railroads have contributed to the progress and growth of the nation, the local transportation systems have contributed to the industrial and commercial development of the communities they serve. Modernization is necessary, however, to keep pace with changing demands

PROGRESS in the United States of America has been built upon good transportation. So accustomed have our people become to having good transportation facilities that little thought is ordinarily given to their real significance. They are more or less taken for granted. Yet it is these facilities that have materially assisted the remarkable growth of this country. In this, both the trunk line railroads and the local transit systems in our cities and towns have played important rôles. Without them our present industrial and commercial development could not have been attained.

To illustrate this point, let us compare the progress of China with that of the United States. China, with an area of more than 4,000,000 square miles, is substantially larger than this country, and its population of more than 400,000,000 is more than three times as great as ours. Similarly, while China is relatively rich in natural resources, it is largely an agricultural country whose potential producing power has not been fully developed. Back in the early days of the world's history when civilization was dawning, China was a leader in progress. Its learned men were of the front rank. Its scientists and scholars are perhaps equally able today, but new to modern thought, and they represent only a minute fraction of China's population. The general level of education in that country is distressingly low. A tremendous majority of the population cannot read or write. Radically different dialects are spoken in different parts of the country. Development of every kind, material and intellectual, has been almost incredibly belated. In a very large measure this state of affairs is the result of woefully inadequate transportation facilities.

Now turn to see what we have in the United States. The people speak the same language from the Atlantic to the Pacific and from the Rio Grande to the Great Lakes, live in homes of similar designs, read the same magazines, listen to the same radio broadcasts and wear the same kind of clothes. The country yokel is no longer a butt for the comedian. In fact, apprehension has sometimes been expressed lest our population become completely standardized. Be that as it may, no one can deny that this country is united to a remarkable extent in thought and spirit. When the United States entered the World War in 1917, one of the things that most surprised European observers was our ability to secure speedy and concerted action by the whole population. Undoubtedly this was due in large measure to the familiarity of the average American with parts of the country other than his own, and his understanding of the viewpoint of his fellow countrymen. And this in turn was made possible only by the existence of good transportation facilities.

Local transportation is in its own sphere no less vital than the nation-wide transportation system. Those who have watched the development of our cities during the past 40 years are familiar with the important part which transit facilities have played. Community development in the United States has followed lines entirely different from those in other countries. Our cities cover much larger areas. Distances from home to place of employment are far greater. A majority of our industrial workers find it possible, and naturally enough desirable, to live in suburban or semi-suburban neighborhoods. In other countries, more or less all over the globe, the tendency is for the worker to live close to his job. Living conditions here are greatly to be preferred to those elsewhere, we believe, and this superiority is due in large measure to the possession of better transportation facilities.

Dr. Julius Klein

Assistant Secretary of Commerce since 1929 and from 1921 to 1929 Director of the United States Bureau of Foreign and Domestic Commerce, Dr. Julius Klein is in a position to view the broad picture of business and industry in this country and throughout the world as few others have been. Prior to entering the Government service he devoted many years to the study of history and economics, serving from 1915 to 1923 as instructor and later assistant professor at Harvard University. The relationship between transportation and industry has always been of particular interest to Dr. Klein. From his vast fund of knowledge and experience, he takes many interesting and pertinent facts from which he draws important conclusions that he presents in this article.

For example, let us compare the transportation facilities in Marseilles, France, and Pittsburgh, Pa., cities of approximately equal size, each having a population slightly in excess of 650,000. In Pittsburgh, the street railway operates more than 1,400 cars on approximately 600 miles of track. The Marseilles tramway, on the other hand, operates only some 900 cars on less than 200 miles of track. To supplement the electric railway service in Pittsburgh a subsidiary company operates 86 buses on about 120 miles of route. In Marseilles 19 buses are operated on 8 miles of route. The total number of passengers carried per year on cars and buses is approximately 165,000,000 in Marseilles as compared with 360,000,000 in Pittsburgh. I have taken this comparison as typical. Many of the European cities have far poorer facilities and carry far fewer riders.

The effect of this difference in transportation facilities has been incalculable. Our facilities have been indispensable in building up our strength as a leading industrial nation. But it is not simply because of its past accomplishments that transportation deserves consideration. It is because the need for these facilities exists today as never before. The recently completed census of 1930 shows a marked shift of population from the country to the city. Fifty years ago more than 70 per cent of this country's population was rural. Just prior to 1920 a balance was reached between urban and rural population, each being approximately 52,000,000. During the past decade the urban population has increased about 15,000,000 while the rural population has grown about 2,000,000, making the present ratio about 55 urban to 45 rural. If this trend continues, the relationship existing in 1880 will be completely reversed by 1965, when it is likely that more than 70 per cent of the total population will be urban.

Thus it is evident that future demands for urban transportation facilities are likely to be greater, rather than less, than those existing today. Just what form this demand will take, no one can predict with accuracy. Street car, motor bus, taxicab and rapid transit service—all are likely to be needed. And, of course, the private automobile will play an important part.

The extent to which the private automobile can be used for municipal transportation has not yet been conclusively demonstrated. In many cities, at the present time, regulations have been established which prevent parking in areas during business hours, and while this matter has been met by automobile owners through the establishment of downtown garages, it must still be noted that traffic in these congested areas is handled for the most part by the municipal transportation system.

While private transportation was increasing from about 1,000,000 to 25,000,000 automobiles, municipal transportation systems continued to attract increasing traffic until 1923, and since that time have maintained practically a constant level. In the meantime, these local services have been expanded through the inauguration of bus lines and taxicab companies until now they provide a dominating feature in the lives of nearly all individuals.

It has often been said that Andrew Carnegie won his position of learedship in large degree because he was always ready to replace a machine or a complete steel plant as soon as better equipment became available, and he did not care whether the machinery he discarded was ten years or ten weeks old. He recognized with the deep, shrewd penetration of true genius that old machinery will not do, that our indispensable need is for the very best equipment that can be obtained, and that obsolete machines should not be continued in use when something better is available.

In recent years machinery designers have been showing marvelous progress. Improvements have been so outstanding that many a machine becomes too expensive to operate long before it is worn out. Take just one of numerous cases that have come recently to my attention: Six machines were ordered for a certain operation in manufacture. Before they were delivered a better design had been developed. These machines were actually obsolete before they could be put to work. What did the management do? Did it try to make shift for a while with the inferior equipment? No, this firm had both courage and true wisdom. It paid the bill, quietly scrapped the six machines and replaced them with the better type.

In this connection, it is interesting to note the developments being undertaken by the electric railway companies and manufacturers who supply their needs. I refer specifically to the formation of a Conference Committee by the presidents of representative electric railways, which was organized to consider how a group of associated operating companies might bring about a radical improvement in the present car situation. Approximately $500,000 was subscribed in practically equal proportions from the interested railway companies and the manufacturers of cars and car equipment. The work of the committee will continue approximately three years, during which time it will endeavor to co-ordinate the efforts of the car builder or equipment manufacturer with the car operators. It proposes to finance worthwhile experiments and to try out the experimental product to determine its practical usefulness. It is estimated that this conference committee represents more than 60 per cent of the potential car-buying power of the industry. It is hoped that these practical experiments will provide a vehicle so flexible as to meet all the requirements of the operating companies.

It was only a few years back that the trolley bus in modern form was reborn in Salt Lake City. This modern vehicle has a degree of flexibility over any given route nearly equal to the motor bus, and it appears to fill a distinct need in the electric railways industry.

Clearly the local transportation companies are rendering an essential public service. That they are facing numerous difficulties and serious problems, no one can deny. But ways and means of providing modern transportation must be devised. I have confidence that solutions to these problems will be found, and that the electric railways will continue to play a very important part in our industrial and commercial development.

This is the first of a series of articles by men of national prominence outside the electric railway industry. The second article of the series will appear next month.—Editor.

New Speed Record Established on North Shore Line

A NEW record in high-speed service between downtown Milwaukee and the Chicago Loop was established by the Chicago, North Shore & Milwaukee Railroad on Sunday, Feb. 15, when travel time between the centers of the two cities was cut to one hour and 45 minutes. This is a further reduction of five minutes from the high-speed schedule of one hour and 50 minutes inaugurated by the North Shore Line last September. At that time, fifteen minutes was cut from the running time of two limited trains in each direction daily.

The two limited trains leaving Milwaukee terminal at 8 a.m. and 8 p.m., daily, which inaugurate the new service, will make a total of five limiteds covering the distance between Chicago and Milwaukee in less than two hours each day. The others are the Northland Limited and the Prairie State Special, leaving the Chicago Loop at 8:05 a.m., and 3:05 p.m., respectively, and the Prairie State Special, leaving Milwaukee terminal at 3 p.m., daily.

Under the new operating schedule, the two new limiteds will stop to receive passengers at Racine, Kenosha, and Edison Court, Waukegan. They will operate without stop over the Skokie Valley Route, arriving at the Randolph and Wells station in the Chicago Loop at 9:45. All-steel equipment of the latest type will be used.

This further reduction in running time between these cities is made by the North Shore Line with a view to meeting the growing public demand for fast transportation. The excellent on-time records maintained since the establishment of the new fast schedule last fall convinced the management that greater speed is both practicable and desirable, with proper regard for the convenience and safety of the customers. The public approval of this new high-speed service is seen in the large numbers of passengers using these trains.

North Shore train in operation at a speed greater than 70 m.p.h.

Along the New York division near Bristol, Pa. Overhead construction similar to this will be used for the remainder of the electrification

Pennsylvania Railroad Speeds Electrification *Program*

Improvements originally scheduled for next four years will be completed by 1933, according to announcement by President Atterbury. Plans involve expenditure of $175,000,000

EXPEDITING its program for electrification and other major improvements, the Pennsylvania Railroad will complete the construction already projected in 2½ years instead of four, as originally intended. The decision was announced last week by W. W. Atterbury, president of the company. The change was decided on primarily as a means of relieving the present unemployment situation.

Last year it was the intention of the railroad to spend about $90,000,000 in its program of construction work. Actually, $106,000,000 was so spent. It was originally expected that the remainder of the work would be spread over four years, but the officials of the railroad have come to the conclusion that now is the time to go ahead with redoubled energy. The plans in hand call for improvement items which in cost will total some $175,000,000. With commodity prices stabilized and the efficiency of labor greater than in past years, it is believed that these improvements can be contracted for on an exceptionally favorable basis. On account of reduced traffic the work can be done with less interference from the movement of trains, so that this in itself constitutes a definite economy.

The improvements contemplated involve the use of upward of 150,000 tons of steel, the purchase of 240 electric locomotives, the electrification of 80 passenger cars, and, in addition, very large expenditures for labor in connection with the various pieces of construction. Prompt completion of the plans will mark one of the greatest steps forward in the ability of the Pennsylvania Railroad to give more efficient service to those who use its lines, according to Mr. Atterbury. These improvements undoubtedly will involve new financing, but in view of existing low interest rates and the plethora of savings in the country that are clearly available for investment as soon as confidence is restored, the present and the near future are regarded as a most favorable occasion for the necessary financing.

Electrification Between New York and Washington Is Featured

The projects which it is now proposed to push forward to early completion include the following:

1. Electrification of the remaining portions of all the lines of track between New York and Washington, in-

Trenton is the present eastern terminal of the alternating-current electrification. Multiple-unit suburban trains are operated between there and Philadelphia

New signal bridges are used to give the needed clearance for the overhead wires. A comparison of the heights is seen here

cluding electrification of the entrance to the Potomac yard.

2. Completion of the new station being built at Philadelphia.

3. Extensive improvements in and near Newark, including the erection of a new passenger station and the building of a new bridge over the Passaic River. This will involve abandonment of Manhattan Transfer.

4. Six-tracking of the line through Elizabeth.

5. Building of a new line around Trenton, including the construction of a new bridge over the Delaware River.

6. Extensive improvements at Baltimore, including the removal of numerous grade crossings and the building of new tunnels through Baltimore.

7. Various undertakings of less magnitude at different points on other portions of the railroad.

Considerable Portions of the Work Already Under Way

At the present time, considerable progress has been made on several of the projects enumerated. The map shows the status of electrification as it exists. Between Wilmington and Trenton the tracks have been completely electrified, except for the portions which must be constructed in connection with the Philadelphia terminal improvements. The main line is electrified as far west as Paoli, and the lines to Norristown, Chestnut Hill, and West Chester also are electrified. On all of these lines the suburban service is now being given with multiple-unit electric trains.

Between Sunnyside Yard, on Long Island, and Manhattan Transfer, N. J., the New York terminal zone has been operated with 650-volt direct current from a third rail for all passenger service for the past twenty years. The new plan contemplates operation with 11,000 volts single phase from overhead contact wires. Footings are in for the supporting poles to hold the catenary structure for the entire distance, and the steel has been erected the greater part of the way. A portion of the overhead contact wires has been installed in the Pennsylvania station. It has been necessary to drop the track in the tunnels under the Hudson and East Rivers. It also has been necessary to cut a groove in the roof of the tunnel to give clearance for the overhead wires. This work has been carried out during the nights for a number of months, and is now nearly completed.

At Newark the land has been cleared for some time for the erection of the new passenger station, and the bridge across the Passaic River adjacent to the station location is under construction. The right-of-way south of the Newark station is being cleared preparatory to construction of the new viaduct through the city. Foot-

Connecting the overhead wires on the line to the new Broad Street suburban station in Philadelphia. The old viaduct adjacent to Market Street will be torn down

Manhattan Transfer, where steam locomotives have been interchanged with direct-current third-rail locomotives of the type shown during the past 21 years, will be eliminated

ings for the overhead poles between Elizabeth and New Brunswick also have been installed, although none of the steel work has been erected. Between Newark and Elizabeth the change to six tracks has prevented the erection of the overhead system.

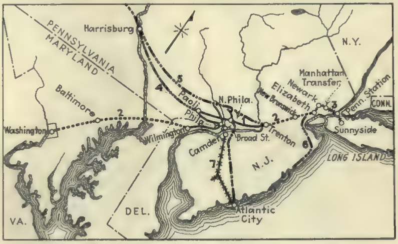
The construction work in Philadelphia is progressing rapidly. The new Broad Street suburban station and the 30th Street station were placed in service last September. The old line through West Philadelphia is being dismantled preparatory to building the new passenger terminal. Improvements in Philadelphia were the subject of an article in this paper for November, 1930, page 696.

NO WORK HAS BEEN STARTED SOUTH OF WILMINGTON

South of Wilmington none of the projected work has been started. The plan calls for the construction of tunnels for two additional tracks through the city of Baltimore. When these are completed and in service it will be necessary to enlarge the existing tunnels to provide for the electrification of the two existing tracks. At Washington it will be necessary to install the necessary overhead wires in the Union Station and the approaches, as well as through the tunnel under the Capitol grounds leading to the Potomac yard.

For the past year or more the leading electrical manufacturers have been co-operating with the electrical department of the Pennsylvania in the design of new locomotives for use on the electrified lines. It has been planned to produce engines of capacity to haul the heaviest passenger trains at speeds of 90 m.p.h., and to handle the heaviest freight trains. Four electric locomotives have been built and are now being tested by the railroad. Conferences between the railroad officials and representatives of the manufacturers are now being held to work out a program for the construction of the 240 locomotives which are necessary for main line electrification, and for the equipment of 80 additional passenger coaches for multiple-unit service.

Power for the New York terminal zone is now furnished by the company's power plant on Long Island, and a certain amount is purchased from the local utility companies. In the Philadelphia district all the power is obtained from the Philadelphia Electric Company. Plans have not been announced for the power supply for the remainder of the system, but unless it is purchased it will be necessary for the railway to erect one or more large power stations.

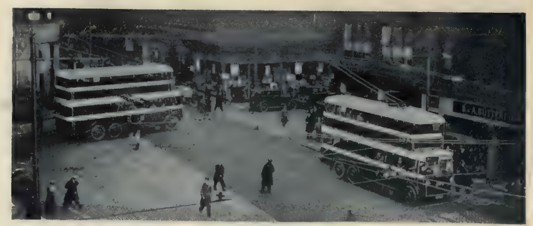


Electrification plans of the Pennsylvania are comprehensive, as may be seen from this map

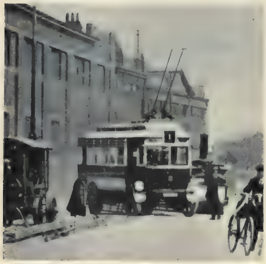
1. Electrified line now in operation for suburban service only.
2. Lines included in the program for immediate electrification.
3. Line between Manhattan Transfer and Sunnyside yard, being changed from direct current to alternating current.
4. Main line between Paoli and Harrisburg, steam operated.
5. "Low-grade" freight line, also steam operated.
6. New York & Long Branch Railroad, operated jointly by the P.R.R. and Central Railroad of New Jersey.
7. Camden-Atlantic City electric line, operated by direct current.

Electric locomotives of this type but equipped for direct current were purchased in 1924 for use in the New York terminal zone. They will be reconnected for single phase. The locomotive illustrated was built originally for single-phase operation.

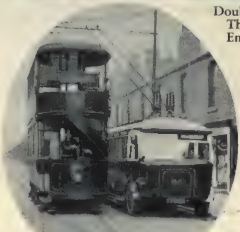
VIEWS OF *English Trolley Buses*



Double-deckers in business district of Bradford. This system, with 58 vehicles, is the oldest in England

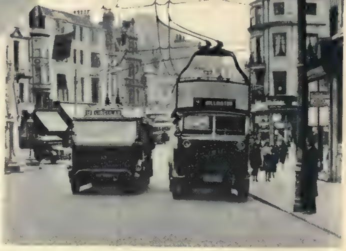


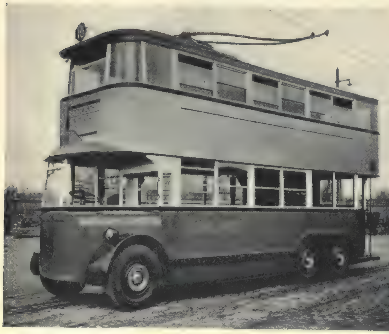
An early type of vehicle in Ipswich, showing its maneuverability over a street under repair



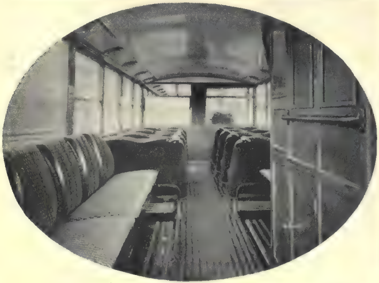
View of a single-deck trolley bus and a double-deck tram in Rotherham, where service was begun in 1912

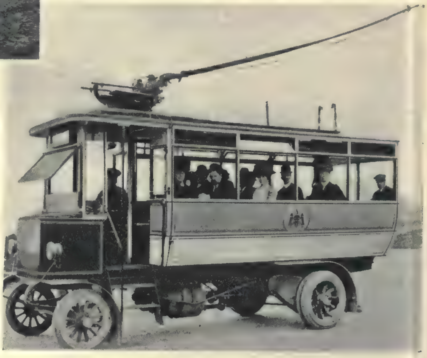
Hastings has 50 single-deck vehicles and 8 open-top double-deckers as shown below. The overhead is of interest since it is designed at this point for parallel operation of two vehicles

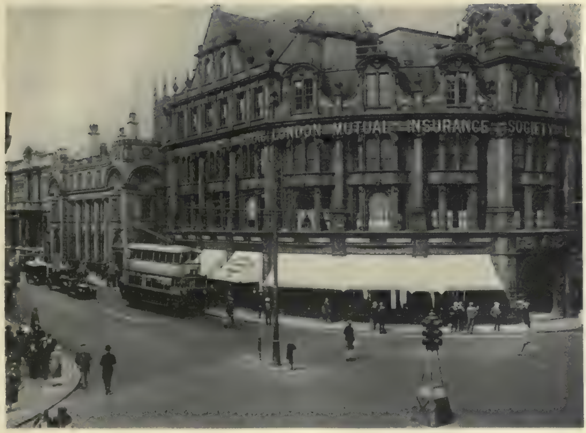




A study of the old and the new. At left—type of vehicle recently specified for service in London. Lower left—interior of the London trolley bus, showing the luxurious appointments. Below—A pioneer type of vehicle, placed in service in Leeds in 1911







Wolverhampton, with 70 vehicles, has the largest trolley bus system in England. Note the ornamental poles in the street center for the overhead

Trolley Bus Operation in England

Expanding Steadily

With 24 systems operating approximately 545 vehicles and others planning new installations the trolley bus has assumed an important position in the transportation system of England, where development of the vehicle has been in progress for more than twenty years

UNDERGOING a steady evolution, urban transportation in England has been subject to many changes in the past few years. Although the trams are still he backbone of the transport systems in most large cities, there seems to be a general attitude that other vehicles have a very definite field of usefulness and for certain nstallations a greater appeal to the public. As in the United States, unprofitable and wornout car lines are being abandoned in favor of the trolley bus and gasoline bus. Both of these forms of transport have made great strides in England, partly due to the dictates of economic necessity and partly to the demand on the part of the public for something new. Substitutions have been made only after careful consideration, so that most installations of trolley buses and gasoline buses have proved advantageous. Furthermore, the newer forms are being coordinated with the existing lines to the fullest extent possible.

One need only become familiar with the statistics of trolley bus operation in England to sense the opinion that this type of vehicle is becoming more and more popular for several types of service. While the development of the trolley bus in America has been accelerated during the past three years, in England the vehicle has experienced a steady increase in favor over a period much longer. The result is that at present England has earned the distinction of being the unquestioned leader in this form of transport, along with being credited as the pioneer in developing the vehicle.

Table III—Trolley Bus Operations in England and Wales (As of Jan. 1, 1931)

Name of System, City and County	Date Started	One-Way Route Mileage	Equipment					Total Operating Costs in Cents per Vehicle-Mile	Vehicle Maintenance Costs in Cents per Vehicle-Mile	Type of Service	Expansion Pla
			Number	Manufacturers	Seating Capacity	Single Deck or Double Deck	Number of Motors and Rating of Each in H. P.				
Bradford Corporation Tramways Bradford, Yorkshire	June, 1911	25.57	*58					23.27	4.57	Replaces two car routes and operates in territory not previously served.	Converting anot car route at p sent. Have auth ization for routes inside a 10 routes outs the city.
			3	Own make	30	S	1—45				
			3	Associated Equipment	37	S	1—50				
			3	Associated Equipment	30	S	1—50				
			1	Associated Equipment	35	S	1—50				
			3	Garrett	31	S	1—50				
			3	Garrett	30	S	1—50				
			1	Garrett	37	S	1—50				
			1	Garrett	35	S	1—50				
			10	English Electric	36	S	1—60				
			17	English Electric	34	S	1—60				
			1	English Electric	31	S	1—60				
			12	English Electric	56	D	1—80				
			†12	English Electric	56	D	1—100				
Rotherham Corporation Tramways Rotherham, Yorkshire	October, 1912	7.75	*36					16.24	2.94	Replaces car routes and operates in territory not previously served.	Replacing rail lin to extent of 4.75 miles.
			5	Clough, Smith	32	S					
			2	Railless	32	S					
			4	Straker-Squire	32	S					
			5	Guy	32	S	1—60				
			20	Ransomes, Sims & Jefferies	32	S	1—60				
Keighley Corporation Tramways Keighley, Yorkshire	Old, 1913 Present-Dec., 1924	3.41	*14					21.69	3.42	Replaces car lines.	
			10	Straker-Clough	50	D	2—40				
			4	Straker-Clough	32	S	1—40				
Ramsbottom U.D.C. Railless Traction & Motor Omnibuses, Ramsbottom, Lancashire		3.44	2								System being aba doned.
Mexborough & Swinton Traction Company Rawmarsh, Yorkshire Operation between Rotherham and Conisbrough	August, 1915	12.10	30	Garrett	32	S	1—60	19.01	1.68	Replaces car lines, supplements existing lines and operates in territory not previously served.	Planning line to Ne Housing Estates.
Tees-side Railless Traction Board South Bank, Yorkshire Operation near Middlesbrough, in North Riding of Yorkshire	November, 1919	5.10	*15					17.58	2.94	Operates in territory not previously served.	
			10	Railless	26	S	2—25				
			5	Straker-Clough	36	S	1—40				
Birmingham Corporation Tramway & Omnibus Dept. Birmingham, Warwickshire	October 7, 1922	2.50	*16					25.13	5.37	Replaces one car line	
			15	Railless	51	D	2—42				
			1	Associated Equipment	51	D	1—55				
Ipswich Corporation Transport Ipswich, Suffolk	September, 1923	16.79	*44					18.92	3.01	Replaces car line and operates in territory not previously served.	Another route i under considera tion.
			3	Railless	30	S	2—20				
			1	Ransomes, Sims & Jefferies	30	S	1—35				
			1	Tilling-Stevens	30	S	2—20				
			15	Garrett	30	S	1—50				
			24	Ransomes, Sims & Jefferies	30	S	1—50				
Wolverhampton Corporation Transport Department Wolverhampton, Staffordshire	October, 1923	30.00	*70					20.76	2.98	Replaces car and motor bus lines.	Converting moto bus routes. Ove 5 miles in Falling Park area bein converted at pre sent.
			32	Tillings-Stevens	36	S	2—25				
			38	Guy	61	D	1—60				
West Hartlepool Corporation Transport Service West Hartlepool, Durham	February, 1924	8.20	*31					21.54	4.04	Replaces car lines and operates in territory not previously served.	
			6	Railless	36	S	1—42				
			1	Railless	48	D	1—50				
			12	Garrett	32	S	1—50				
			12	Clough, Smith	32	S	1—60				
Wigan Corporation Tramways & Motors Wigan, Lancashire	July 5, 1925	1.57	4	Clough, Smith	36	S	1—40	23.14	4.04	Replaces car lines.	
Ashton-under-Lyne Corporation Tramways & Motors Ashton-under-Lyne, Lancashire	August 26, 1925	2.50	8	Short-English Electric	37	S	2—25	25.16	4.94	Replaces car lines.	Substituting for a worn-out car line.
Southend-on-Sea Corporation Light Railways and Transport Department Southend-on-Sea, Essex	October, 1925	1.75	*11					28.71	3.79	Replaces part of one car line and supplements existing lines.	Adding approximately 10.75 miles in territory not previously served.
			2	Short	36	S	1—35				
			1	Associated Equipment	30	S	1—50				
			1	Garrett	55	D	2—35				
			5	Garrett	60	D	2—30				
			2	English Electric	58	D	2—40				
Darlington Corporation Transport Department Darlington, Durham	March, 1926	9.57	*32					19.80	2.46	Replaces car lines and operates in territory not previously served.	Applying for au- thority to open a 1.50 mile route in the center of the city.
			24	Clough, Smith-Roe	31	S	1—60				
			2	Ransomes, Sims & Jefferies	32	S	1—60				
			6	English Electric	32	S	1—60				
Grimsby Corp. Tramways Grimsby, Lincolnshire	October 3, 1926	1.50	7	Garrett	32	S	1—50	20.07	4.45	Replaces car lines.	Planning expansion.
Nottingham Corporation Passenger Transport Department, Nottingham, Nottinghamshire	April 10, 1927	5.49	*24					23.32	3.24	Replaces car lines, supplements existing lines and operates in territory not previously served.	All existing car lines and some motor-bus lines to be converted during the next 8 to 10 years.
			10	Railless	50	D	2—30				
			2	Ransomes, Sims & Jefferies	50	D	2—32.5				
			6	Ransomes, Sims & Jefferies	60	D	2—40				
			6	English Electric	59	D	2—40				

*Total. †On order.

Table III—Trolley Bus Operations in England and Wales (As of Jan. 1, 1931)—*Continued*

Name of System, City and County	Date Started	One-Way Route Mileage	Equipment					Total Operating Costs in Cents per Vehicle-Mile	Vehicle Maintenance Costs in Cents per Vehicle-Mile	Type of Service	Expansion Plans
			Number	Manufacturers	Seating Capacity	Single Deck or Double Deck	Number of Motors and Rating of Each in H. P.				
esterfield Corporation ransport Department, esterfield, Derbyshire	May 1927	5.50	14	Straker-Clough	32	S	1—60	20.12	3.48	Replace car lines.	Expanding in the near future.
. Helens Corporation ransport Department, St. Helens, Lancashire	July 11, 1927	5.90	*15 4 1 5 5	Garrett-Ransomes, Sims & Jefferies Ransomes, Sims & Jefferies Ransomes, Sims & Jefferies Ransomes, Sims & Jefferies	35 32 35 56	S S S D	1—50 1—50 1—50 1—80	20.21	1.36	Replaces car lines and operates short distance in territory not previously served as a route extension.	Converting 2.57 additional route miles of car line at present.
Hastings Tramways Company, Ltd. Hastings, Sussex	April 1, 1928	21.54	*58 8 50	Guy-Dodson Guy-Rnsmes, Sims & Jeff.	57 37	D S		18.08			
aidstone Corporation ransport Department, Maidstone, Kent	May 1, 1928	4.22	*15 8 7	Ransomes, Sims & Jefferies English Electric	58 56	D D	2—32 2—40	24.94	5.37	Replaces car and motor bus lines.	Adding approximately two miles.
oncaster Corporation Tramways, Doncaster, Yorkshire	August 22, 1928	6.53	*24 4 19 1	Garrett Karrier-Clough Bristol Tramways	60 60 60	D D D	1 1 1	19.00	5.60	Replaces car and motor bus lines, supplements existing lines and operates in territory not previously served.	Planning expansion.
tinghamshire & Derbyire Traction Company, ngley Mill, Derbyshire											
th Lancashire Transport Company, Atherton, Lancashire	1930	8.00	10	Guy-Roe	60	D					
typridd Urban District ramways, Pontypridd, Wales	September 18, 1930	3.50	7	English Electric	32	S				Replaces car lines.	Planning expansion.
stallations to Be Made Soon											
don United Tramways, td., To serve Kingston and Twickenham areas	Early in 1931	Have powers for 20 mi.	50 to 60		56	D	1—80			To replace car lines.	One vehicle delivered and 4 route miles converted to date. Work advancing on remaining program.
sall Corporation Tramways & Motors, Walsall, Staffordshire	In April 1931		2	English Electric		D					

*Total

Reasons for the popularity of the trolley bus in England are many. Replacing, in many cases, worn-out track it does away with the necessity of expending huge sums for rebuilding the permanent way. Other advantages are he low cost of making extensions to existing routes, ability to maneuver in traffic, rapid acceleration, high scheduled speed for service with frequent stops and comfortable riding. Another advantage, applicable particularly in England, is that the trolley bus consumes electrical energy which is generated at coal burning plants, thereby using the product of a local industry. Gasoline buses must rely on other countries for their fuel supply. These reasons, along with past records, indicating that the vehicle is entirely suitable for many classes of service, have led to its widespread adoption.

An accurate picture of the extent of the trolley bus operations in England, as well as the rapid growth over the past three years, can be obtained from the figures in Table I, taken from the annual report of the Ministry of Transport. These figures, under two dates for each column, are for the close of the first calendar year in the case of private companies and for the financial year closing March 31 of the second listed year, in the case of municipal or county undertakings. At the close of the last reported period, the capital expenditure amounted to $9,639,760, an increase of $2,870,773 over the previous year and $4,491,261 over the second preceding year. Total number of vehicles in operation soared from 338 in 1927-28 to 389 for the following year, and to 477 for 1929-30. At the close of 1930, approximately 545 were in operation. Route-miles open for traffic showed a similar growth. In the first of the three years reported mileage totaled 111.34. The next two reports showed 132.63 miles and 168.76 miles. At the close of 1930, this figure had reached 192.43 miles. Over this route a total of 13,671,161 vehicle-miles were operated during the

Table I—Financial and Operating Statistics of Trolley Bus Systems in England for Three Financial Years

	1927–28	1928–29	1929–30
apital expenditure	$5,148,499	$6,768,987	$9,639,760
ross receipts	$2,430,493	$3,037,755	$3,861,504
Vorking expenses	1,871,266	2,259.856	2,848,213
Net receipts	$559,227	$777,899	$1,013,291
)perating ratio, per cent	76.99	74.75	73.76
nterest and dividends	$164,219	$211,237	$217,683
Redemption of debt	$319,421	$348,370	$413,619
Trolley buses in operation (approximate)	338	389	477
Route-miles open for traffic	111.34	132.63	168.76
Revenue passengers carried	80,112,970	99,065,544	127,461,837
Average fare, cents	....	2.96	2.94
Vehicle-miles run	8,323,076	10,456,379	13,671,161
Vehicle-miles run per vehicle-hour	8.33	8.57	8.86

Table II—Undertakings with Authority to Use Trolley Buses (1928-29 Ministry of Transport Report)

Accrington
Barrow-in-Furness
Bolton
Colchester
Croydon—3.92 miles
Darwen
Gloucester
Lincoln—3.00 miles
Lowestoft—4.75 miles
Manchester
Northampton—1.63 miles
Reading—4.93 miles
Sheffield—9.21 miles
Tynemouth—5.00 miles
Wallasey
West Bromwich

Double-decker in Nottingham, rounding a sharp curve in the business district

Trolley bus in St. Helens with two trams. The overhead at this point is of particular interest

1929-30 year, a substantial increase over the two previous years. Probably the most impressive figure is that of total revenue passengers carried. This was 127,461,837 for the 1929-30 report, representing an increase of 28,396,293 over the previous year and 47,348,867 over the second preceding year.

These increases in riding are reflected in the gross receipts, which show a steady climb to the figure $3,861,504 for the latest report. Net receipts for the same period totaled $1,013,291, almost double the figure for the second preceding year. The favorable trend of the ratio between gross receipts and working expenses is shown by the decline of the operating ratio from 76.99 per cent in 1927-28 to 74.75 in the following year, and to 73.76 in 1929-30. Incidentally, it is worthy of note that amounts for interest, dividends and redemption of debt have been increased substantially each year.

That this growth is to continue is indicated by the expansion plans reported by the systems now operating and by reports of other cities making new installations. Further evidence is contained in the list of undertakings in Table II which have received authority for commencing trolley bus systems. These are taken from the 1928-29 Ministry of Transport report. In the latest report several more have been added. Referring to Table III, which gives data on all present trolley bus operations in England and Wales, it will be observed that, of the 24 undertakings listed, fifteen are planning to expand their existing systems. Some of these reports indicate that very extensive additions are to be made.

In the near future two more undertakings will commence services with the trolley bus, the London United Tramways, Ltd., and the Walsall Corporation Tramways & Motors. The London company has obtained powers for operating approximately 20 miles of route and has ordered between 50 and 60 vehicles for early delivery. One vehicle has already been delivered and 4 route-miles have been converted. Work is progressing rapidly on the remaining program. It is not improbable that this system will become one of the largest operators in the world. Walsall plans to inaugurate its service with two double-deck vehicles in April of this year.

Because of the rapid growth of the trolley bus in America, a study of Table IV, giving comparative figures of English and American systems, will be of interest. On Jan. 1, 1931, England and Wales were operating 545 vehicles over 192.43 miles of route in 24 localities. On the same date the United States and the Philippines were operating 167 vehicles over 70.05 miles of routes in twelve cities. For England and Wales the figures represented increases over Jan. 1 of the previous year by two undertakings, 68 vehicles and 23.67 route-miles. For the United States and the Philippines the increases were five cities, 101 vehicles and 42.26 route-miles. Bradford, which inaugurated a pioneer system in June, 1911, has

Table IV—Comparative Figures of English and American Trolley Bus Systems

	Number of Systems		Vehicles in Service		One-Way Route Mileage		Oldest System in Operation	Largest System in Operation on Jan. 1, 1931
	Jan. 1, 1931	Jan. 1, 1930	Jan. 1, 1931	Jan. 1, 1930	Jan. 1, 1931	Jan. 1, 1930		
England and Wales	24	22	545	477	192.43	168.76	Bradford June, 1911	Wolverhampton 70 vehicles (32 single-deck—38 double)
United States and Philippines	12	/	167	66	70.05	27.79	Baltimore November, 1922	Chicago 74 vehicles (all single-deck)

Table V—Receipts and Expenditures of English Trolley Bus Systems in Cents per Vehicle-Mile. (Company figures are as of Dec. 31 of first-listed year; annual local authority figures are as of March 31 of second-listed year.)

	1913-1914	1925-1926	1926-1927	1927-1928	1928-1929	1929-1930
Income:						
Traffic	16.34	27.76	26.82	28.48	28.18	27.48
Miscellaneous	0.68	0.16	0 16	0.12	0.14	0.18
Gross receipts	17.02	27.92	26.98	28.60	28.32	27.66
Expenditures:						
General repairs and maintenance	4.68	5.42	4.76	4.40	4.52	4.32
Power	2.06	3.32	3.58	3.30	3.10	3.12
Traffic	5.48	11.80	12.10	11.34	10.96	10.54
Rates and taxes	0.28	1.16	1.04	1.06	0.78	0.64
Compensation and accident insurance	0.30	0.44	0.44	0.48	0.38	0.40
General	0.90	1.58	1.64	1.44	1.44	1.38
Gross working expenditure	13.70	23.72	23.56	22.02	21.18	20.40
Net receipts	3.32	4.20	3.42	6.58	7.14	7.26

Table VI—Types of Service Being Rendered by 22 English Trolley Bus Operators

STREET CARS, TROLLEY BUSES AND GASOLINE BUSES

Ashton-under Lyne
Birmingham
Bradford
Doncaster
Grimsby
Nottingham
Rotherham
St. Helens
Wigan

STREET CARS AND TROLLEY BUSES

Mexborough & Swinton
Pontypridd
Southend-on-Sea

TROLLEY BUSES ONLY

Darlington
Hastings
Ipswich

TROLLEY BUSES AND GASOLINE BUSES

Chesterfield
Keighley
Maidstone
Ramsbottom
Tees-side
West Hartlepool
Wolverhampton

As in this vehicle for Southend-on-Sea most of the double-deckers are mounted on six wheels

Trolley bus in residential section of Darlington, where 32 vehicles are in service

the distinction of being the oldest system in operation in England. In this country the Baltimore system is the oldest, having started in November, 1922. The largest system in England at the start of this year was Wolverhampton with 70 vehicles and 30 route-miles. In America, Chicago with 74 vehicles and 17.55 route-miles was the largest. It should be pointed out that all of the Chicago vehicles are single-deck while in Wolverhampton 38 of its 70 vehicles are double-deck.

At the close of 1930 there were two systems in England with 58 vehicles, Bradford and Hastings. Other large systems include Ipswich with 44 vehicles, Rotherham with 36, Darlington with 32 and Nottingham with 24. In terms of passengers carried the Wolverhampton system, which carried 23,175,998 passengers during the 1929-30 annual period, also holds the lead. Ipswich was second with 12,175,012 and Darlington third with 9 850,266.

Previous reference to Table I showed the increase in gross receipts for the last three recorded years, as well as the increased net receipts and lowered operating ratio. Supplementary figures are given in Table V, which shows receipts and expenditures in cents per vehicle-mile for 1913-14 and the five years from 1925-26 to 1929-30. They indicate a steady increase in gross receipts and a continued reduction in gross working expenditures. The result is a climb in net receipts from 3.32 in 1913-14 and 4.20 in 1925-26 to 7.26 in 1929-30. The classification of expenditures shows how operating expenses are apportioned. A downward trend in both maintenance and traffic indicates that as the undertakings become more familiar with the vehicles they are able to operate them more efficiently. According to the Ministry of Transport returns for 1929-30, Maidstone, with 42.32 cents per vehicle-mile, had the largest traffic income. Birmingham was second with 35.72 cents, and Wolverhampton third with 35.44 cents. The lowest working expenditure per vehicle-mile was recorded at West Hartlepool with 16.06 cents. This city was followed by Rotherham with 16.24 cents and St. Helens with 16.60.

It is interesting to note that three of the systems in England—Darlington, Hastings and Ipswich—operate trolley buses only. Three systems operate street cars and trolley buses, nine operate street cars, trolley buses and gasoline buses, and seven operate trolley buses and gasoline buses. These classifications are shown in Table VI. The further classification of the types of service rendered by each system is shown in the second last column of Table III. This indicates whether the trolley bus system replaces street cars, replaces gasoline buses, supplements existing lines, operates in territory not previously served or accomplishes a combination of these. Analysis of the types of service shows that in nineteen cities car lines are replaced, in three gasoline buses are replaced, in four supplementary service to existing lines is given and in ten service is given in territory not previously served. This last figure indicates that the trolley bus is being used to advantage for developing new areas. The several combinations of the various types of service also show that these undertakings believe the trolley bus has a wide field of application. For the most part the Bristol lines are comparatively short, and several operate through densely populated territory. This is in keeping with observations in America, which show

Table VII—Analysis of Seating Capacities of 543 English Trolley Buses

372 Single-Deck Vehicles		171 Double-Deck Vehicles	
Seating Capacity	Number of Vehicles	Seating Capacity	Number of Vehicles
26	10	48	1
30	54	50	22
31	28	51	16
32	131	55	1
34	17	56	24
35	11	57	8
36	59	58	10
37	62	59	6
		60	45
		61	38

Table VIII—Analysis of Motor Equipment of 447 English Trolley Buses

304 Single-Deck Vehicles		143 Double-Deck Vehicles	
Number of Motors and Rating of Each in Horsepower	Number of Vehicles	Number of Motors and Rating of Each in Horsepower	Number of Vehicles
1-35	3	1-50	1
2-20	4	1-55	1
1-40	13	2-30	15
1-42	6	1-60	38
1-45	3	2-32	10
2-25	42	2-32.5	2
1-50	84	2-35	1
1-60	141	2-40	31
2-35	8	1-80	17
		2-42	15
		1-100	12

Table IX—Trolley Bus Abandonments in England

Aberdare Urban District Council Tramways
Dundee Corporation Transport—1.25 miles
Halifax Corporation Tramways—3.84 miles
Leeds City Tramways—9 miles—15 vehicles (Started June 20, 1911—Ceased July 26, 1928)
Oldham Corporation Tramways—1.50 miles (Ceased in September, 1926)
Stockport Corporation Tramways & Omnibuses—1.70 miles
York Corporation Tramways & Motors—1.25 miles—2 vehicles (Ceased Dec., 31, 1929—Reopening at an early date)

Double-decker wending its way through traffic in the city of Maidstone

Trolley bus in Chesterfield making a turn at the end of a line by using a wye

that the trolley bus is suitable for frequent-stop service.

Study of the trolley bus specifications of the vehicles listed in Table III shows that, although several types are in use at present, there are trends toward certain seating capacities, number of wheels and motor equipment. While referring to Table VII which gives the number of vehicles of the various seating capacities, it should be remembered that in America all of the trolley buses built in 1928, 1929 and 1930 have a seating capacity of either 40 or 43.

As will be seen from Table VII, more than two-thirds of the vehicles in service are of the single-deck type. With the exception of two small fleets, in which the vehicles have six wheels, all of the single-deckers are mounted on four wheels. This is the same as in the United States, for all vehicles are now using four wheels. Most of the double-deck vehicles are mounted on six wheels. Of the 171 double-deckers listed, 50 of this number, those in Hastings, have open tops with a bow at the front for supporting the trolley poles, while 121 have closed tops.

Table VIII shows the motor equipment of 447 vehicles in service. The total motor ratings range from 35 to 70 hp. for the 304 single-deckers, and from 50 to 100 hp. for the 143 double-deckers. In this connection it should be noted that the largest motor rating for the double-deck vehicles in England (this rating has been specified for twelve vehicles now on order) has been used exclusively on all modern American systems. All of the 116 vehicles ordered in the United States in 1930 were equipped with two 50-hp. motors.

Although experiments with trolley buses were conducted in England prior to 1911, the first actual installations for service were made in June of that year in Bradford and Leeds. These two systems attracted much attention and several undertakings adopted the vehicle for portions of their transport systems, including Rotherham, Keighley, Ramsbottom, Mexborough & Swinton. Aberdare, Stockport and Dundee. The early vehicles, like those in America, were not very satisfactory and the last three named systems were abandoned subsequently, along with certain routes of the other undertakings. However, during the World War period, a shortage of materials and absence of trained men had the effect of delaying maintenance and construction work for many of the electric railway systems. As a result, a new interest was taken in developing the trolley bus. Teesside adopted the vehicle in 1919, and in 1922 an installation of the modern type vehicle was made in Birmingham which aroused much interest. The success of this installation led to the inauguration of service in several other cities.

With the exception of the Leeds sytem, which involved 9 route-miles and fifteen vehicles, all trolley bus abandonments in England have been of small systems. In the case of York, which suspended its operations on Dec. 31, 1929, a reopening is planned for an early date. The abandonments are listed in Table IX.

Fleet of Wolverhampton trolley buses in front of the carhouse where they are stored and maintained

State Regulation of Taxicabs

Making Progress

Requirements concerning permits, service, rates, equipment, insurance, etc., in Connecticut, Rhode Island and Pennsylvania are compared. Other states are likely to adopt similar regulatory measures

By

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MOST forms of motor transportation operated for the service of others than the operator have been subjected to state regulation, but little effort has yet been made to apply state regulation to taxicabs. The nature of the service and the locus of its operation account for this exemption. The taxicab offers individual transportation, while the trolley and bus serve the public indiscriminately. The former operates on no fixed route, but proceeds to any point designated by the passenger and may never travel the same route a second time. As it knows no fixed termini, so it observes no time schedule but operates only on demand. More and more, however, the idea that the taxicab should be regulated as a common carrier is gaining ground. This has already been done in six states, of which the most important are Pennsylvania, Connecticut and Rhode Island. Others are likely to follow their lead.

In the last decade, several official pronouncements were made to the effect that the taxicab is not subject to state regulation as a common carrier or public utility. The Illinois Commerce Commission ruled that by leaving regularly from some point and going to any of various destinations as directed by the passenger, making trips only on demand, and observing no uniform rate schedule, the operator does not constitute himself a public utility under state control.[1] The North Carolina supreme court in 1926 held that a taxicab operating between cities, observing no time schedule, and taking whoever offered, does not come under the common carrier requirement of a certificate of public convenience and necessity.[2] In the same way the supreme court of Arkansas holds that a taxicab in going beyond the limits of a municipal corporation to deliver an occasional passenger does not transform itself into a common carrier.[3] In California the railroad commission does not consider as a common carrier an operator transporting goods from a city as a center and within a radius of 75 miles.[4] But the Illinois commission has ruled that a taxicab accepting passengers anywhere on the route covered by a certified carrier (bus) and discharging them likewise thereby transforms himself into a public utility.[5]

Fifteen years ago, taxicab rides averaged from two to three times the present day cost, and consequently, the taxicab was the vehicle for the few. But the increasing desire for prompt individual or group transportation has resulted in tremendous expansion of the taxi business during the past few years. In becoming so common the taxicab is re-enacting the experiences with railroads, street cars, motor buses and aviation: Evils are appearing which call for some form of public control.

Outstanding among these evils are unrestricted and destructive competition, bringing woe to the taxicabs themselves and to the street cars and buses; lack of public confidence in the stability of taxicab business; jeopardizing of public safety and dependability of service, and increased burdens to the already over-congested thoroughfares. Consequently, in a few states regulation has been begun, the purposes of which is to protect transportation, including taxicab, bus and street car, against the disastrous effects of unrestrained competition; to secure business-like methods, stability, safety, and dependability in taxicab service; and to limit the number of taxicabs to the demands of public convenience and necessity.

Momentum has proceeded from not only the competitors and the public, but also from the taxicab operators themselves. At their convention in Chicago, June 16, 1930, the National Association of Taxicab Owners passed a resolution favoring regulation of taxicabs as public utilities. Unfair competition and cut rates, both so flagrant at the present time, constitute the chief basis of the resolution, which proposes specifically: (1) Control by state or city utility commission; (2) requirement of certificate of public convenience and necessity to operate; (3) public indemnity protection; (4) rates based on taxi meter; (5) minimum and maximum rates "based on cost of operation with a reasonable profit."

It appears that the earliest state control of taxicabs

Elmwood Park *vs.* Anderson, Public Utilities Reports, 1923 A, 13

State *vs.* Andrews, 132 S.E. 568.

State *vs.* Haynes, 300 S.W. 380.

Re Moore, P.U.R. 1927 C. 396.

Austen Brothers *vs.* Bloom, P.U.R. 1925 D, 363.

was established in Pennsylvania in 1914. Since the Terminal Taxicab case in 1916, taxicabs have been subject to a certain amount of commission control in the District of Columbia. In 1929, Connecticut instituted a comprehensive scheme of taxicab regulation, and Rhode Island followed suit in 1930.

The Connecticut act empowers the public utilities commission to require of every taxicab operating in the state a certificate of public convenience and necessity for such operation, registration with state motor vehicle commissioner of all vehicles authorized, to prescribe adequate service and maximum reasonable rates, safety measures, to issue rules and regulations governing taxicab operation in general, and to modify, and "for sufficient cause shown" revoke the certificates. Pursuant to the statutes, the commission has issued detailed regulations.

The Rhode Island act follows so closely the Connecticut act that there is no doubt of the latter being used as a model. Chief differences are regulation in Rhode Island is confined to taxicabs operating in cities, and that registration of certificated vehicles is made with the bureau of public roads. Both statutes create a *presumption* of public convenience and necessity as a basis of granting the certificate to applicants who have been in bona fide operation for a stated period prior to application.

Early in 1930, a regulatory bill was introduced in the Massachusetts legislature. Local authority over taxicabs would remain as at present except as to rates; taxicabs would have to operate exclusively in the area for which certificated, and administration of the regulation would be put on the state department of public utilities. Though this measure failed of enactment, its introduction reveals active interest in state control of taxicabs.

In each of the three jurisdictions—Connecticut, Rhode Island and Pennsylvania—taxicabs are declared common carriers. Simple though it may seem, it is not easy to define just what a taxicab is. The Connecticut regulatory act concerns public service motor vehicles operated as taxicabs. Chapter 77, Public Acts 1921, defines a public service motor vehicle as "any motor vehicle used for transportation of passengers for hire." But after defining taxicabs as "any public service motor vehicle operated on any street or highway on call or demand, accepting or soliciting passengers indiscriminately for transportation for hire between such points along such streets or highways as may be directed by the passenger," the regulatory act specifically excludes jitneys and motor vehicles in livery service.

REQUIREMENT OF CERTIFICATE

The most important step in the regulatory process is certification, and this has proved to be the biggest administrative task. In Connecticut everyone operating taxicab service must have a certificate of public convenience and necessity issued by the state commission. After application is made, a time for hearing on the application is fixed. Notice is served by the commission on local authorities concerned and on common carriers in the territory involved. The statute authorizes any city, town or borough in which the proposed service is to operate to bring to the commission a petition relative to rates, service and equipment, convenience and safety of passengers and the public.

Public convenience and necessity, universally used in state regulation as basis of certificates of common carrier buses operating on fixed routes and between definite termini, is much more difficult to determine in the case of taxicabs. The matter of public convenience and necessity warranting taxicab operation is influenced in urban areas by difference in degree of riding habit acquired, presence and types of other transportation agencies, social, commercial and industrial conditions, topography and weather.[6]

Neither a desire to expand nor an occasional excess of business constitutes public convenience and necessity; nor in determining this convenience and necessity do cheaper rates and a consequent big demand for service necessarily outweigh better equipment and safer operation possible under slightly higher rates. Here the commission views rates charged and the volume of business as important, but not the controlling factors; quality and safety of service are paramount considerations. This agency recognizes quantity of service as a factor in holding that for Hartford and environs, comprising 230,000 population, 136 taxicabs were sufficient and that public convenience and necessity did not warrant authorizing fifteen more.

A usual provision is that creating statutory presumption of public convenience and necessity as basis for granting certificates to applicants who have been operating bona fide service for a stated period prior to making application.[7] But if the commission finds public convenience and necessity lacking in these cases of bona fide operators, it is authorized to deny the certificate. On him who was not operating bona fide service in period specified by the Connecticut statute rests the burden of proof to show that the service proposed is necessary. And if a bona fide operator who gets a certificate on statutory presumption later seeks to increase the number of vehicles authorized, he must prove public convenience and necessity to warrant the commission's authorizing the additional equipment.

Practically all the applications of bonafide operators during the prior period in Connecticut have been granted on statutory presumption. In this commonwealth 960 taxicabs have been authorized to date. Rhode Island has issued certificates to 90 operators employing 413 taxicabs, and a conservative estimate indicates the number of certificates granted in Pennslyvania at 500, most of them for one and two vehicles.

Grounds for denial of applications for certificates appear in the records. To eleven dissatisfied members of an association, which had previously obtained a joint certificate to operate 35 taxicabs, the Connecticut commission expressed its inability to issue separate certificates. The fact that they had withdrawn from the association did not warrant certificating them separately. To authorize more public motor vehicles than public service requirements warrant merely adds to traffic congestion and is, therefore, unwise. Application to operate seven more taxicabs in Stamford (30,000 population) was denied on the ground that the 76 existing taxicabs were sufficient. Failure to show that gross income or net income reflected a growing demand for additional service over the period before the regulatory statute "when company of its own accord could have increased the number of cabs" appeared as ground for denial of request for increased service.

Further, the Connecticut commission reports the denial of several applications on grounds of (1) applicant's failure to perform such service prior to July 1, 1930, as to warrant commission conclusion that the service had been bona fide and therefore entitled to the certificate; (2) character and records of the applicants; (3) inadequacy of evidence to show existence of public convenience and necessity.

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[6] **Connecticut Commission. Re City Cab Service, Inc., Docket 5399.**

[7] **Section 8 of Connecticut Act Cited—Note 18; and Section 7 of Chapter 1552, Rhode Island Public Laws 1930.**

In Rhode Island practically all applications from those not operating on Feb. 15, 1930, (date of beginning of statutory presumption) have been denied because of failure to show that existing taxicabs are unable to take care of convenience and necessity of the public.

Undue competition denies a paying business and the principle of public convenience and necessity limits the extent of competition that shall exist. Where more taxicab service is warranted, the Connecticut agency follows the legislative presumption and preference for those operators already engaged, and concludes that established carrier, if willing and able to institute additional service warranted, must have the first opportunity to do so.

EQUIPMENT SAFETY AND LIABILITY PROTECTION

Taxicab equipment is a matter put under commission control. A certificate of equipment is issued by the Connecticut and Pennsylvania commission on application therefor, and a memorandum of the certificate must be kept posted in each taxicab operated under the certificate, and commission approval is essential for increasing equipment.[8] Not only the authorization of all equipment legally used, but also the functions of inspection and ordering out from service equipment found lacking in safety or suitability are placed in the Connecticut commission. Further, every certificate holder is to devise a scheme of inspection of equipment and also keep available for the commission reports on the inspections made. In Rhode Island equipment, inspection, lighting, and safety are matters handed over to the board of public roads.[9]

Inspection of equipment further reflects the desire for safety. Despite legislation and regulations accidents arise, and public authority requires taxicabs to provide liability protection. This may take the form of insurance policy, or indemnity bond. The amount required in Pennsylvania and Rhode Island is $5,000 for any one injury and $10,000 for any one accident, with $1,000 property damage protection. Connecticut differs in amount only in requiring $10,000 protection against any one injury.

In each jurisdiction waiver of the liability protection requirement is permitted if financial responsibility to pay damages assessed in accidents which may rise in course of operation is shown. In Pennslyvania the waiver has been granted to a few taxicab operators in rural communities whose revenues do not justify the cost of liability protection and whose operating records show sufficiently little hazard. The commission has permitted the waiver also in a number of cases where a cash liability reserve is maintained, the amount being determined by the commission, and kept in the bank subject to withdrawal only for payment of accident losses. On satisfactory evidence of financial responsibility the Connecticut commission waives the liability protection. While the insurance requirement in Rhode Island is not in the jurisdiction of the utilities commission, waiver can be had by those taxicab operators who possess financial responsibility of $40,000 over and above all fixed liabilities.

Statutes amply empower the commissions to prescribe adequate service. This involves the increase and decrease of equipment operated. In Pennsylvania an interruption of service of more than one day, a suspension of five days, and permanent abandonment of service all require approval of the commission.[10]

Power to order reasonable rates is possessed by the above commission. Section 2 of the Rhode Island statute empowers the commission to approve proposed rates or to modify rates. In Connecticut the commission may make reasonable rules and regulations relative to fares. Because the type of taxicab service acceptable and satisfactory to one element of the public is not the same as for another element, it is difficult to fix taxicab rates. Without attempting to standardize rates on a time and distance basis, the Connecticut commission recognizes that the "metered cab with reasonably metered rates is the logical form of taxicab service."

TRANSFER AND REVOCATION OF CERTIFICATES

Transfer of certificates can be made only on approval of the commission, and this body must be satisfied as to the purpose and conditions of transfer and as to character and ability of the transferee. Power to amend the certificate in view of public convenience and necessity is usually conferred on the commission, and likewise is the power to revoke a certificate for cause shown in a hearing.[11] Failure to comply with the rules and regulations and orders of the commission constitute the frequently stated ground for revocation. The Connecticut rules go further and add the repeated violation of any traffic ordinance or a state motor vehicle law.

Regulation got under way in Rhode Island only a short time ago, and no certificate has been canceled to date. Several certificates have been revoked in Connecticut for failure to take out taxicab license plates within a reasonable time after certificate was granted. In Pennsylvania failure to provide liability protection as required has figured prominently as a cause of revocation, and in a few instances the conclusion of the commission that "the operator was not a fit person to be entrusted with rights, powers, and privileges granted by the certificate of public convenience authorizing the service," resulted in revocation of the certificate.

In summary of the situation today, it appears that the nature of service offered by taxicabs and the locus of their operation, heretofore accepted as warranting exemption from regulation as common carriers, is no longer so considered in all states. Regulation of taxicabs as common carriers has been instituted in Pennsylvania under the general public service company law, but in Connecticut and Rhode Island by legislative enactment *de novo*. In these three jurisdictions, taxicabs must, like other motor common carriers, prove public convenience and necessity to get the required state certificate to operate. Experience has shown, however, that it is more difficult to define and measure public convenience and necessity in regard to taxicab service than in regard to motor buses. Questions of service and rates bid fair to assume important proportions in the process of control. With the growing complexity of motor transportation problems in urban areas and the increasing inter-relations of various forms of transportation therein, other states can be expected to follow the lead taken by Pennsylvania, Connecticut and Rhode Island.

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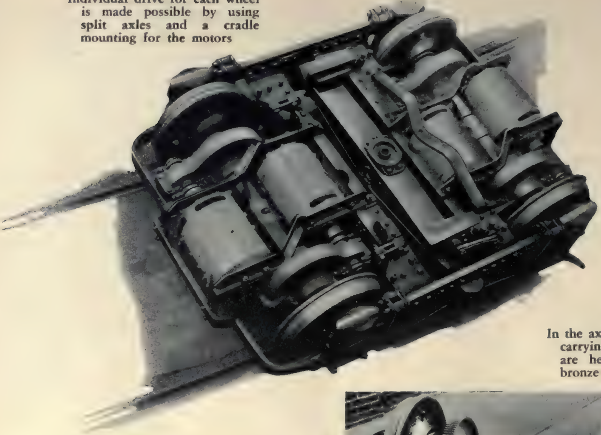
[8] Preliminary rules and regulations for taxicab operation, Par. [illegible]. Pennsylvania Commission, Rules and Regulations Governing Motor Vehicle Transportation Companies Rule 4.

[9] Section 5 of regulatory act.

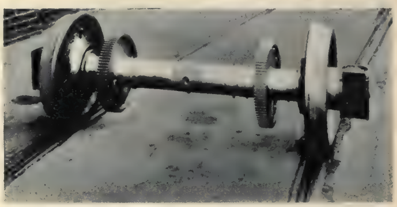
[10] Rules and Regulations Governing Motor Vehicle Transportation Companies, Rules 4 and 11.

[11] Connecticut Act, Section 3; Rhode Island Act, Section 3.



Individual drive for each wheel is made possible by using split axles and a cradle mounting for the motors

In the axle assembly the sleeves carrying the wheels and gears are held in position by a bronze coupling at the center



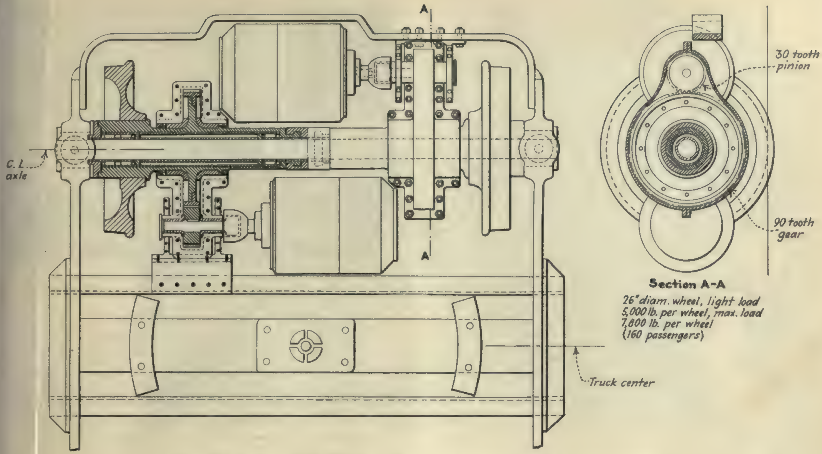
Individual Wheel Drive Adopted

on Lehigh Valley Transit Car

Split axles with wheels and gears carried on sleeves allow independent movement. Motor mounting in cradles supported from the truck eliminates dead weight on axles

DRIVE by an individual motor on each of the eight wheels of a double-truck street car is made possible by the use of split axles in a design recently developed by the Lehigh Valley Transit Company, Allentown, Pa. The arrangement is said to overcome the difficulties inherent to solid axles of the ordinary type. It permits free passage of the car around curves of short radius, and results in easy starting and smooth acceleration. There is no lateral movement to the car body caused by wheel thrust against the rail heads. There is very little pounding over special work. It is stated that there is a reduction in energy consumption of substantially 40 per cent in city service.

Trucks which are modified from the Brill Type 177-E are used for the car. Instead of having the journals rotate in journal boxes held by pedestals, the axle proper, which extends the full width of the truck, is fastened rigidly at its ends in pedestal blocks held by the guides. Two free-running sleeves surround this axle, each carrying a wheel and a gear for drive from the corresponding


A
A
C. L. axle
30 tooth pinion
90 tooth gear
Section A-A
26" diam. wheel, light load 5,000 lb. per wheel, max. load 7,800 lb. per wheel (160 passengers)
Truck center

Details of the axle, wheel mounting and motor drive are shown in this drawing.

electric motor. The two sleeves are held in alignment by a collar engaging flanges on their inner ends.

The axle has a diameter of 3 in. It is held in the pedestal blocks at the two ends by means of pins passing completely through the axle and blocks. The pins take the strain as well as hold the entire assembly together. The wheels have a tread diameter of 26 in. They are special, being cast of electric steel, and have a bore of 10$\frac{1}{4}$ in. to allow them to be pressed on the sleeve which forms the wheel hub and also contains the roller bearing housings.

The housing for the roller bearings is made of an electric steel casting. It has a bronze cap on the pedestal block side which takes the end thrust. On the face of this cap is a 1-in. shoulder which enters the pedestal block, thus acting as a safety guard and preventing the wheels from leaving the truck even if the axle should be removed entirely. By this means the possibility of derailments or accidents due to broken axles is eliminated.

At the inner end of the sleeve or roller bearing housing a flange is turned so that it appears similar to the neck of a medicine bottle. The two sleeves are separated by a small distance, but are held from movement along the axle by a bronze coupling made in two halves bolted together. The appearance of this coupling is shown in the illustration of the wheel and axle assembly and in the line drawing.

Split axles are used under this Lehigh Valley Transit Company car

Straight, solid roller bearings made by the American Roller Bearing Company are placed inside the housing, which has a hardened raceway pressed into it. A hardened raceway also is shrunk on the axle. Double rollers with a total length of 5$\frac{1}{4}$ in. are placed directly under the wheel and single rollers 2$\frac{5}{8}$ in. long are used at the inner end of the housing. All the rollers are of $\frac{13}{16}$ in. diameter. American Lubricating Company roller bearing grease is used in the roller bearing housing.

Two motors driving the two wheels on one axle are mounted directly on the truck frame by means of a cradle entirely free from the axle. The method of mounting may be seen clearly in the illustration of the assembled truck. In place of a pinion on the motor armature shaft there is a cup-shaped casting having a socket with a square center. This socket is lined with a leather facing. Engaging inside this socket is the squared end of a short pinion shaft which has its bearings in the gear case. There is $\frac{1}{8}$-in. clearance on each side, and $\frac{3}{8}$-in. horizontal motion is allowed in either direction to take up any lost motion of the wheel and gear case. The center line of the armature shaft and the pinion shaft are kept in line at all times by means of bosses cast on the top and bottom gear cases, so that when the case is assembled these bosses form a trunnion which is held in brackets rigid to the truck frame. The bosses also form bearing housings for the pinion shaft. This

General Specifications of the Experimental Car of the Lehigh Valley Transit Company

Number of units	1
Type of unit	one-man; two-man; motor; passenger; double-end; double-truck
Number of seats	48
Weights: Car body	24,740 lb.
Trucks	19,600 lb.
Total	44,340 lb.
Bolster centers	18 ft. 6 in.
Length over all	42 ft. 6 in.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 5 in.
Aisle width	21½ in.
Height, rail to trolley base	10 ft 10 in.
Height, rail to floor	2 ft. 11¼ in.
Body	Wood, semi-steel, all steel
Roof	Arch
Doors	End, double folding
Air brakes	Westinghouse 10 x 12; General Electric type S valve
Axles	Special split
Car signal system	Electric Service Supplies Co.
Compressors	General Electric Co., CP-27
Compressor governor	Westinghouse S-6A
Conduit	Flexible metal
Control	Westinghouse VA
Destination signs	Illuminated.
Door mechanism	National Pneumatic Co
Floor covering	6-in. asphalt tile
Gears and pinions	Tool Steel Gear & Pinion Co.
Hand brakes	Peacock staff
Heaters, body	Consolidated Car-Heating Co., 1112-JT
Heaters, platform	Consolidated Car-Heating Co., R-3312-TI
Headlights	Golden Glow
Interior trim	Walnut
Journal bearings, roller	American Roller Bearing Co.
Lamp fixtures	Electric Service Supplies Co., Type T-27902
Motors	Eight GE-1126
Sanders	Ohio Brass Co.
Seats	Brill type 201-B deep pitch
Seating material	Brown leather
Steps, stationary	15¼ in. and 13¾ in.
Tail lights	Electric with Philco battery and E. S. S. Co. relay
Trolley retrievers	Ohio Brass Co.
Trucks	Brill 177-E, modified
Ventilators	York
Wheels, type	Electric cast steel, 26 in. diameter
Wheelguards	H-B
Window wipers	Hand swipe, single blade

arrangement has proved simple and effective, functioning properly without abuse of the coupling.

Electric steel castings form the two parts of the gear case. They are held together with bolts passing through a broad flange at the horizontal split, the joint being made oil-tight with a gasket. American Lubricating Company lead-base grease is used in the gear case. The drive is from a 30-tooth pinion of 6 pitch and 2½-in. face made by the Tool Steel Gear & Pinion Company, which engages a 90-tooth ring gear riveted to a flange cast on the wheel hub. Bronze bearings are used for the pinion shaft and for the support of the gear case on the axle sleeve.

Each wheel is driven by an individual GE-1126 automotive type motor, rated at 16¼ hp. The eight motors of the car are handled with a dual speed control, permitting pairs of motors to be placed in series or in parallel, and giving a speed range from 17.5 m.p.h. for the series position of the controller up to a maximum of 60 m.p.h. for full parallel position. The controller is of the Westinghouse VA automatic type. It has a ball handle lever moving ahead or back, or it may be operated equally well by means of a pedal.

Control equipment is concealed in a cabinet in front of the motorman. The reverser has only the top exposed, permitting change of direction or dynamic emergency braking. A small lever, which has been developed for this car, actuates a National Pneumatic Company two-door air valve to make the connections for high and low speed. In one position this gives low speed, suitable for city service, reaching 17.5 m.p.h. in series and 33 m.p.h. in parallel. Throwing this lever to the high-speed position gives 33 m.p.h. in series and 60 m.p.h. in parallel. This arrangement is made possible by the use of four reverser cylinders operated by air. Each cylinder controls one axle unit of two motors. For the low speed each unit of two motors is connected in series; for the high speed the motors are connected in parallel.

The interior of the car is pleasing, being finished in walnut with buff headlining

Other control devices are concealed as far as practicable. Only half of the brake valve and handle are exposed. The wheel of the hand brake is the only portion that can be seen. The sander, the whistle and the air gong are controlled by hand buttons placed conveniently for the operator.

Along with some 40 other cars belonging to the company, the body which is mounted on the experimental trucks has been modernized according to the program which the company has carried out during the past year. The general appearance of the car is seen in the illustrations. Walnut graining is used for the interior trim, the stanchions being finished in white enamel. Semi-individual deep pitch brown leather seats have been installed, and the flooring is 6-in. red and green asphalt tile. The front vestibule has a windshield of the sloping type to eliminate glare. Lighting is by twenty individual dome lights, which give a soft effect against the buff headlining. Other details of the car are included in the table of specifications.

This development of the truck and axle for individual motor drive was made by W. C. Klein, superintendent of equipment of the Lehigh Valley Transit Company. The car is now being tested on the lines of that company.

◆

"Genie Civil" Celebrates 50th Anniversary

COMMEMORATING its founding 50 years ago, *Genie Civil,* the French engineering weekly, has published a special 236-page review of progress during the last half-century. The issue is devoted to a series of special articles by leading French engineers, and covers the entire range of industrial progress, both in France and other countries all over the world.

Electric railway developments are treated in an article by H. Parodi, president of the French Electrical Society, and honorary director of electrification of the Paris-Orleans Railway. Mr. Parodi reviews the early history of electric railways, most of which took place in America. This is followed by a section on urban rapid transit lines. Railroad electrification, according to the author, is being furthered by the creation of great power networks.

Fast trains give frequent service between all important points on the Indiana Railroad System

Aerial view of the Spy Run carhouse, yards and power plant at Fort Wayne

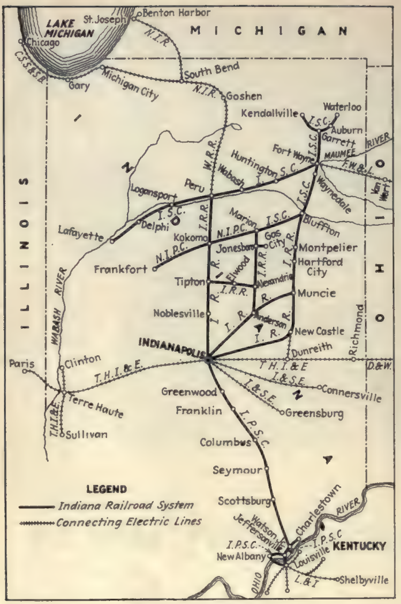
Reorganized Indiana Interurbans in Strong Position

Rail and bus operations of the Northern Indiana Power Company, the Indiana Service Corporation, the Interstate Public Service Company and the former Union Traction Company have been co-ordinated and many improvements made in property and service

DURING the past several months many changes have been made in the corporate relationships, personnel and operations of the electric railways n central and north central Indiana, owned by the Insull interests. Major moves have included the purchase of the Union Traction Company; its reorganization as the Indiana Railroad; the formation of the "Indiana Railroad System" including also the Northern Indiana Power Company, the Interstate Public Service Company and the Indiana Service Corporation; the establishment of central offices in Indianapolis for these four units, a redistribution of personnel together with co-ordination of certain activities for all four operating companies; consolidation of maintenance facilities and sale of certain intercity bus lines.

Particularly notable have been the efforts of the management to improve the equipment, track and service. Desirous of rendering the highest possible standard of passenger service, the system placed orders recently for 35 new interurban cars of the most modern type to be used on all its lines. These are described in detail on page 170 of this issue. A large mileage of track has been reconditioned or rebuilt. Many of the schedules, both limited and local, have been readjusted to give higher speed and to allow more convenient connections at junction points. Special and chartered service has been developed extensively and business has been stimulated by careful advertising and merchandising methods. Establishment of through rates and schedules, uniform rates and special fares for weekend trips and quantity use have assisted in this program.

To increase its freight business, the system has arranged joint rates with connecting electric railways and steam roads, adding many points of distribution, constructed interchange tracks at principal points, combined freight terminals, increased the speed of freight trains, adopted with other companies a drayage absorption tariff, and appointed traffic representatives in the



Indiana Railroad System

I. S. C.—Indiana Service Corporation.
N. I. P. C.—Northern Indiana Power Company.
I. R. R.—Indiana Railroad.
I. P. S. C.—Interstate Public Service Company.

Connecting Lines

C. S. S. & S. B.—Chicago, South Shore & South Bend Railroad.
N. I. R.—Northern Indiana Railway.
W. R. R.—Winona Railroad.
F. W. & L.—Fort Wayne-Lima Railroad.
T. H. I. & E.—Terre Haute, Indianapolis & Eastern Traction Company.
D. & W.—Dayton & Western Traction Company.
I. & S. E.—Indianapolis & Southeastern Railroad.
L. & I.—Louisville & Interurban Railway.

principal cities served. By rerouting the lines in two of the cities where local service is given and speeding up the schedules in practically all of the communities, the system has made a real bid for patronage of its city operations.

The relationship of the four operating units which comprise the so-called "Indiana Railroad System" (not a corporate organization) is shown in an accompanying chart. The Midland United Company controls two holding companies, the Central Indiana Power Company and the Midland Utilities Company, as well as two operating units, the Interstate Public Service Company and the Indiana Railroad. Midland United was incorporated on Dec. 26, 1928, as the Midland Utilities Investment Company, its name being changed to the present form on Aug. 29, 1929.

The American Public Utilities Company, which was merged into the Midland United Company on Nov. 21, 1930, was incorporated in June, 1912. It originally owned and controlled the entire capital stock of the Central Indiana Power Company. The latter company owns the entire outstanding capital stock of the Northern Indiana Power Company, established on Nov. 9, 1922.

The Midland Utilities Company, was incorporated on June 22, 1923, as the Public Service Investment Company, and its name changed to the present form on Aug. 22, 1924. It owns and controls the Gary Railways, the Chicago, South Shore & South Bend Railroad and the Indiana Service Corporation. The last was incorporated on Jan. 15, 1920, as successor to the Fort Wayne & Northern Indiana Traction Company, which was sold under foreclosure on Dec. 29, 1919. Control of the railway was acquired by Midland on Jan. 1, 1925.

The Interstate Public Service Company, acquired by the Midland United Company in January, 1929, was incorporated on Sept. 4, 1912.

Union Traction Company of Indiana was purchased by the Midland United Company at a receiver's sale on July 2, 1930, for $3,923,922 and subsequently reorganized as the Indiana Railroad. The original company was incorporated on May 13, 1912, as a consolidation of a company with the same name and the Indiana Union Traction Company.

Equipment and Services of the System

Rolling stock, track mileage, bus routes, interurban rail lines, interurban bus lines and city services of the four operating companies of the Indiana Railroad System are shown in an accompanying table. Where lines have been disposed of, these have been listed separately and notations made of their disposition. In the entire system there are now fourteen interurban lines, three intercity bus lines and eleven cities with local transportation service.

With the services of the four interurbans fully coordinated, the system has many fast limited trains in service between the important centers. For example, there are eight trains daily each way between Indianapolis and Louisville, the late evening train in each direction carrying a luxurious all-steel sleeping car. The run of 117 miles is made in three hours and 35 minutes by a majority of the limited trains.

Six fast through passenger trains operate daily each way between Indianapolis and Fort Wayne, three going by way of Muncie and Bluffton and three going by way of Kokomo and Peru. Scheduled time over the 123-mile fast route is three hours and 45 minutes. Additional trains give local service between certain points along both routes. Several trains also operate between Indianapolis and Marion, via Anderson; between Indianapolis and Muncie, via New Castle, and between Fort Wayne and Lafayette.

A frequent schedule is also maintained between Fort Wayne and Marion, via Bluffton. Between Fort Wayne and the cities to the north, including Kendallville, Auburn and Waterloo, fifteen trains are operated daily in each direction. The main line of the Northern Indiana Power Company extends from Frankfort to Marion, passing through Kokomo. Ten trains in each direction serve this 53-mile line daily.

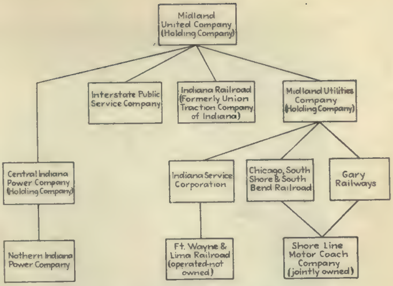
The longest bus line of the entire system is between Indianapolis and Louisville. Three buses operate in each direction daily over the 117-mile run. One of these is operated by Greyhound Lines, Inc., on the Interstate permit.

The principal connecting interurban systems are the Louisville & Interurban Railway, the Terre Haute, Indianapolis & Eastern Traction Company, the Fort Wayne-Lima Railroad, the Winona Railroad, the Northern Indiana Railway, Inc., and the Chicago, South

Shore & South Bend Railroad. The last-named system also is a Midland property, and the Fort Wayne-Lima Railroad is operated by the Indiana Service Corporation.

Two rail lines are operated by the Indianapolis & Southeastern Railroad, extending from Indianapolis to Greensburg and Connersville. In addition to these lines, the company also operates a bus line to Cincinnati, connecting with the rail line at Greensburg. Since this system uses the same terminal in Indianapolis as the Indiana Railroad System, it is possible for passengers to come in over any line of either system and transfer conveniently to another line. During the first two months of 1930, it was reported that the I.&S.E. carried 15 per cent more passengers than in the corresponding period of the previous year. This increase in patronage was attributed to the important improvements in service effected since the reorganization of the line in August, 1928. Among the improvements made at that time were the addition of thirteen new parlor type cars, allowing 100 per cent service with new equipment, institution of bus service between Greensburg and Cincinnati, with five round trips scheduled daily, addition of a freight motor car and twelve freight trailers, rehabilitation of the entire overhead structure, scheduling of many more trains on both divisions, and establishment of attractive rates for special services.

In 1925 plans for a merger of the Terre Haute, Indianapolis & Eastern Traction Company and other companies with the Central Indiana Power Company were announced. This project was disapproved in April, 1930, by the Public Service Commission of Indiana after many hearings. After the consolidation plan was abandoned, a receiver was appointed for the company. Subsequent to the declaration of receivership, several weak and unprofitable lines were abandoned. These included the line between Crawfordsville and Lebanon, and the lines radiating from Indianapolis to Martinsville, Danville, Crawfordsville and Lafayette, the latter line passing through Lebanon and Frankfort. The remaining lines include the main routes from Indianapolis to Richmond on the east and from Indianapolis to Terre Haute and the west, the shorter lines radiating from Terre Haute to Clinton, Sullivan and Paris, Ill., and the connecting line between Dunreith and New Castle.


Midland United Company (Holding Company)
Interstate Public Service Company
Indiana Railroad (Formerly Union Traction Company of Indiana)
Midland Utilities Company (Holding Company)
Central Indiana Power Company (Holding Company)
Indiana Service Corporation
Chicago, South Shore & South Bend Railroad
Gary Railways
Nothern Indiana Power Company
Ft. Wayne & Lima Railroad (operated-not owned)
Shore Line Motor Coach Company (jointly owned)

Organization chart, showing the relationship of the Midland holding companies to the operating company

Following the purchase of the Union Traction Company of Indiana and the organization of the new Indiana Railroad, numerous changes were made to co-ordinate the managerial duties most effectively. Under the present system all officials identified with the four Indiana operating units can be classified into six groups—officials of the holding companies in Chicago; officials in Indianapolis with powers extending over all four operating units and the four operating groups, each concerned with one of the four operating units. Although most of the holding company officials also have supervisory powers over the other utility interests of the Insull properties, certain of them are closely identified with the transportation work. Henry Bucher is executive railway manager of the entire Indiana Railroad System. Associated with him in Indianapolis are L. M. Brown, general superintendent of all interurban lines, and J. Allen Greenland, general superintendent of all city lines.

Equipment, Mileage and Lines of the Four Units of Indiana Railroad System

Northern Indiana Power Company

Equipment

Twenty-five passenger motor cars, two passenger trail cars, two freight motor cars, sixteen freight trail cars, two locomotives, four service cars and five buses.

Mileage

62.87, single track; 3.50, bus route.

Interurban Rail Line

1. Frankfort to Marion, via Kokomo.

City Service

1. Kokomo—rail and bus.

Interstate Public Service Company

Equipment

Seventy-nine passenger motor cars, sev- nteen passenger trail cars, ten freight motor cars, 135 freight trail cars, four ocomotives, nineteen service cars and 2 buses.

Mileage

173 single track; 130.50 bus route.

nterurban Rail Lines

1. Indianapolis to Louisville, Ky., via Franklin, Columbus, Seymour, Scottsburg, Watson Junction and Jeffersonville.
2. Watson Junction to Charlestown.
3. Jeffersonville to New Albany.
4. Louisville, Ky., to New Albany.

Interurban Bus Line

1. Indianapolis to Louisville, Ky., via Franklin, Columbus, Seymour, Scottsburg and New Albany. (Additional suburban service from Indianapolis to Greenwood and Franklin.)

City Service

1. New Albany—rail only.
2. Jeffersonville—rail only.
3. Columbus—bus only.

Indiana Railroad

(Formerly Union Traction Company of Indiana)

135 passenger motor cars, twelve passenger trail cars, 34 freight motor cars, 164 freight trail cars and 23 service cars.

Mileage

341.25, single track; 15, bus route.

Interurban Rail Lines

1. Indianapolis to Bluffton, via Anderson, Muncie, Hartford City and Montpelier.
2. Indianapolis to Muncie, via New Castle.
3. Anderson to Marion, via Alexandria.
4. Indianapolis to Peru, via Noblesville, Tipton and Kokomo.
5. Tipton to Alexandria, via Elwood.
6. Jonesboro to Gas City.

Interurban Bus Lines

1. Indianapolis to Oaklandon.

Disposed of:

1. Indianapolis to Marion, via Anderson and Alexandria. (Leased to Greyhound.)
2. Indianapolis to Peru, via Noblesville, Tipton and Kokomo. (Leased to Indiana Motor Bus Company.)
3. Indianapolis to Sheridan. (Sold to Loren Washington.)
4. Anderson to Muncie. (Sold to Denny and Hines, Inc.)

City Service

1. Muncie—rail only.
2. Anderson—rail and bus.
3. Marion—rail and bus.

Indiana Service Corporation

Equipment

187 passenger motor cars, three passenger trail cars, thirteen freight motor cars, 25 freight trail cars, 93 service cars and twelve buses.

Mileage

287.56, single track; 7, bus route.

Interurban Rail Lines

1. Fort Wayne to Lafayette, via Huntington, Wabash, Peru, Logansport and Delphi.
2. Fort Wayne to Marion, via Bluffton.
3. Fort Wayne to Kendallville, via Garrett.
4. Garrett to Waterloo.

Interurban Bus Lines

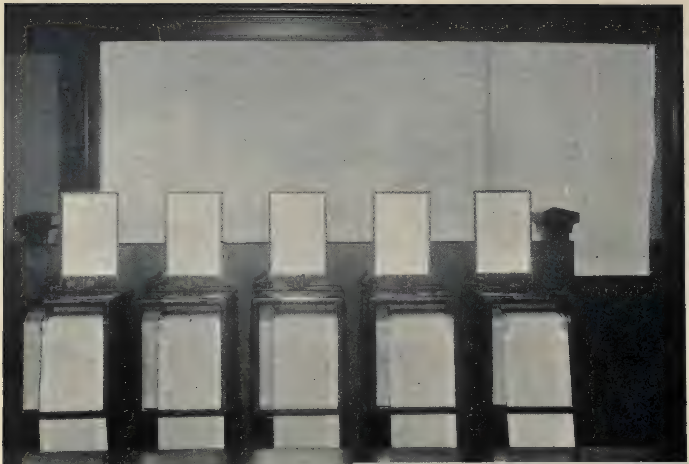
1. Fort Wayne to Waynedale.

Disposed of:

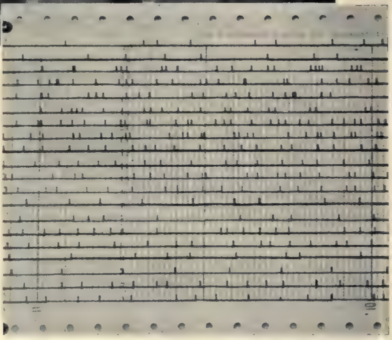
1. Fort Wayne to South Bend. (Sold to Greyhound.)
2. Fort Wayne to Warsaw. (Sold to Greyhound.)
3. Fort Wayne to Huntington. (Abandoned.)
4. Fort Wayne to Coldwater, Mich. (Abandoned.)

City Service

1. Fort Wayne—rail and bus.
2. Logansport—rail and bus.
3. Peru—rail only.
4. Wabash—rail only.



These five headwaygraphs installed by the Brooklyn & Queens Transit System indicate headways in both directions at 47 points on the surface car lines



A section of the record made by the headwaygraph showing the time cars passed in each direction on ten routes in Brooklyn

Headwaygraph

Checks Brooklyn Cars

RECORDS of the service operated past 47 points on 42 surface car lines of the Brooklyn & Queens Transit System are now made by an automatic car recording device or headwaygraph which the company has installed at the headquarters of its transportation department. By means of this device an exact and immediate picture of the service operated is presented. The purpose of this installation is to aid in improving the regularity of service by collecting instantaneously exact information as to the movement of cars at various points on the system. The continual checking of the service also discloses conditions where changes of schedule may be required.

At each checking point an overhead contactor is installed in the trolley wire. When a car passes beneath the pan the trolley wheel closes a contactor in the wire which completes an electric circuit. The current is carried over lines of the New York Telephone Company to the Carroll Street headquarters. Here the line terminates in relays by means of which electric circuits are closed to operate the pen in the recording machine. Each pen corresponds to one checking point. When no car is passing the pen makes a straight line, but when a car closes the contactor the pen makes a short mark at right angles to the line. The paper is revolved by means of an electrically controlled clock and is ruled to indicate the time by minutes. The chart made in this manner becomes a permanent record showing the exact interval between cars for the entire day.

The installation of the headwaygraph cost approximately $25,000. For its use, some 106 miles of telephone circuits in Brooklyn are being rented. It records service in both directions at each of the 47 check points. Five of the headwaygraph machines, each of which has twenty pens, have been installed. At present, 94 of the 100 available pens are in use.

How two electric railways discarded established practices and developed new methods to meet the door-to-door competition of motor carriers

MODERNIZED FREIGHT SERVICE

Attracting New Business

THROUGH the development of motor truck transportation with its door-to-door pick-up and delivery features the shipper of freight has been educated to a service which the electric railways in the past, have not been equipped to render. While extensive interurban railway systems have been created, which, through efficient co-ordination and interchange arrangements, have been giving good freight service over large areas, they have recently found themselves forced to meet competitive services that handle freight directly from the door of the consignor to that of the consignee. At the annual meeting of the Central Electric Railway Association held at Indianapolis, Ind., on Jan. 29 and 30, 1931, two methods of meeting this kind of competition were discussed. T. J. Day, freight traffic manager Pacific Electric Railway, outlined the organization and service of his company and Frank Gerlach, assistant to the president Electric Railways Freight Company, Cleveland, Ohio, described the rail wagon service being operated daily on the Lake Shore Electric Railway between Cleveland and Toledo, Ohio. This article summarizes the information thus presented.

The problem which confronted the Pacific Electric Railway several years ago was probably without parallel anywhere in the United States. A network of paved highways blankets Southern California from the mountains to the sea and weather conditions permit all-year truck operations. These natural and artificial aids to the motor carrier industry resulted in the creation of a truck transportation system which menaced the railway's merchandise and carload traffic. Operating between the central business district of Los Angeles and Los Angeles Harbor, a distance of 21 miles, there are three steam railroads, approximately 42 franchised truck carriers, and probably an equal number of "contract" truck carriers. Pacific Electric endeavored for a number of years to meet the motor truck competition by reducing its rates, but this plan proved generally to be ineffectual as the reductions were followed by corresponding reductions in the truck rates. This experience indicated that the only course left open was to meet competition with similar service.

After a thorough survey, the railway decided to organize a subsidiary known as the Pacific Motor Transport Company. Its charter gives it the right, to engage in business as an express company, as a common carrier by motor truck on the highways, as a local city drayman and as a warehouse company. The charter included the right to operate as an express company because of the definition of an express company under the California law which states that "the term 'express corporation' includes every corporation or person, their lessees, trustees, receivers or trustees, appointed by any court whatsoever, engaged in or transacting the business of transporting any freight, merchandise or other properties for compensation on the line of any common carrier or auto stage line within the state." The charter included the power to do a warehousing business because in many cases motor truck carriers controlled transportation business through their warehousing activities. The power to operate as a city drayman was included for the specific reason that the Pacific Motor Transport Company expects to operate trucks for the railroads in interchange of less than carload freight in Los Angeles or elsewhere.

The decision to operate the Motor Transport Company as an express company was originally for the purpose of economy in operation and greater use of existing rail facilities. The Pacific Electric Railway was operating approximately 600 miles of route serving practically every important municipality in Southern California, and had available sufficient terminal facilities for the establishment of such a merchandise distribution system. It had adequate station facilities which, were capable of handling several times the volume of less than carload freight being handled. The merchandise cars being operated in the freight trains were only partially loaded, and the additional tonnage developed by the motor transport company could consequently be handled at very little additional cost out of pocket expense. The method of operation as an express company is that shipments are picked up by trucks, delivered to Pacific Electric stations where they are loaded into merchandise cars and transported in regular freight service to the destination. After arrival at destination they are again loaded into trucks and delivered to consignees.

Contracts with draymen in various towns who act as agents in the pick-up and delivery of merchandise have been effective in building up the business of the Pacific Electric Motor Transport Company

The Pacific Motor Transport Company began operation on March 11, 1929, serving twenty stations on the Pacific Electric Railway. Since that time the operation has been extended to practically every station of importance on the Pacific Electric Line and now extends also over lines of the Southern Pacific out of Los Angeles, San Francisco, and Portland, Ore., serving today 200 stations on both railroads, and operating over 2,600 miles in California and Oregon.

As far as the users of the service are concerned, they are dealing exclusively with the Pacific Motor Transport Company and the railroad does not enter into the picture at all. The motor transport company has a contract with the Pacific Electric Railway and also one with the Southern Pacific Company, the general terms of which are:

1. That the motor transport company make joint use of the agents and employees of the railway company, and of the station and station buildings of the railway company, for which the railway company bills the transport company.

2. The railway transports the traffic of the motor transport company on the freight trains of the railway company. For this service the railway does not get either its published tariff rate, or any other specific amount; instead the railway is compensated for this line haul service in the following manner:

From the total revenue accruing to the transport company, the transport company deducts the expense of conducting its operations (which consist of pick-up and delivery costs, participation in salaries of joint agents, overhead expenses, etc.) plus ten per cent to be retained as the transport company's profit, and all of the remainder is turned over to the railroad in compensation for line haul service performed.

In addition to the contracts with the railroads, the Pacific Motor Transport Company has contracts with the draymen in the towns served. In making pick-ups and deliveries of freight, these draymen act only as agents of the transport company, not as independent carriers. The shipper, or consignee, looks upon the drayman as an employee of the company. The company's published tariff rates cover the entire service and the draymen get their pay from the company.

Two advantages accrue from this arrangement with the local draymen. No heavy capital investment in motor equipment is necessary. The entire service, pick-up, line haul and delivery, is accomplished by making greater use of existing facilities. The other advantage is that the local drayman becomes an active solicitor for the transport company. His problem has been similar to that of the rail carriers in that the truck lines, by taking the business away from the railroads, have deprived the local draymen of the hauls to and from the rail depots. In many instances, the local drayman is a substantial business man in his community, active in service clubs and other civic affairs, and his contact with the other business men of the town as compared with the highway carrier, who merely passes through, is a distinct advantage in soliciting traffic.

The Pacific Motor Transport Company publishes its own tariff, naming class and commodity rates from store door at point of origin to store door at destination, from store door at point of origin to depot at destination, and from depot at point of origin to store door at destination. It issues its own bill of lading and its tariffs are governed by a separate classification known as "Monroe's Ship by Truck Classification," which is subscribed to by practically all franchise motor truck carriers operating in California.

Rates have been made without any special regard for what the rail rates may be between the same points, but rather for the purpose of meeting the competition of the truck operators serving the same territory. In some instances in order to do this, the Pacific Motor Transport Company has published class rates from store door at point of origin to store door at point of destination, which are actually lower than the railroad rate from depot to depot at the same points. In most instances, however, the class rates have been somewhat higher than the rail rates. Some of them have been sufficiently higher to pay the full cost of pick-up and delivery, but in most cases they have not.

To compete effectively with other truck lines the motor transport company has had to do many things which are a marked departure from railroad methods, such as extension of credit up to a period of 30 days for freight charges. The railroads are prohibited by law from extending credit beyond the maximum period of 96 hours, and then only when the payee has filed a bond, guaranteeing the payment of such charges. Again, another departure from railroad practice is the handling of C.O.D.'s as distinguished from shipper's order bill of lading practice on the railroad. Many shippers look upon the C.O.D. privilege as an indispensable part of the service. A charge is made for handling C.O.D. collections on a sliding scale based on the amount of the collection and considerable revenue is derived from this source. Further, it is a well-established practice among motor truck carriers to accept shipment of merchandise in containers or even without containers in a way which would not be acceptable to the railroads. There is a substantial saving to the shipper in being relieved of the stringent packing requirements of the railroad, and consequently, the motor transport company can and does accept shipments which do not meet railroad packing requirements. Despite this, the claims for damage are about on a par with railroad claims.

The operations of the Pacific Motor Transport Company are essentially those of an express company. Up to the present time its activities have been confined, primarily, to the recovery of less than carload traffic. Nevertheless, in some instances it does operate regular carrier truck service on the highways.

In handling the freight business as carried on jointly by the Electric Railways Freight Company and the Lake Shore Electric Railway, between Cleveland and Toledo, Ohio, the need of a vehicle of less capacity than that of the present electric railway box car was recognized. A freight-handling system comprising units in which from 10,000 to 20,000 lb. of uncrated or unwrapped merchandise may be loaded and transported direct from the warehouse of the consignor to that of the consignee, without rehandling at terminals, was considered to be desirable. With this in mind, the Electric Railways Freight Company developed a rail-wagon system. This system comprises:

1 A railwagon, or highway semi-trailer, that may be drawn over the highway in the same manner as any standard highway trailer, or that may be carried over the railway. In the latter operation the railwagons are carried on a railway flat car, with the wheels hanging over the side of the car. There are two types of standard railwagon designs—the rail-city type, 18 ft. long, with single rear wheels equipped with solid tires, and the rail-highway type, 24 ft. long with tandem rear wheels equipped with pneumatic tires.

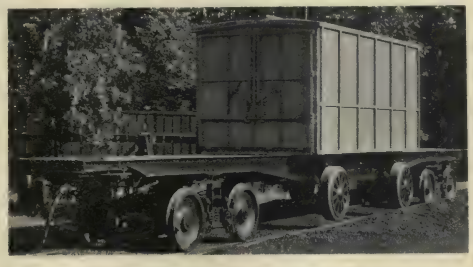
2 A flat car designed to carry three of the rail-city types of railwagons, or two of the rail-highway types. The channels of the flatcar are located inside the wheels instead of outside. The space thus made available is utilized by the wheels of the railwagon, thus making it possible to keep the dimensions of the flat car loaded with the rail-wagon, within the standard prescr bed for electric railway equipment.

3 A simple ramp for loading and unloading the railwagon upon and from the flatcar.

Between Cleveland and Toledo the schedule provides for the movement of three railwagons east-bound and three railwagons west-bound each night. On arrival at destination, the flat car is run between the ramp, the railwagon automatically placed thereon, and the car withdrawn. The railwagons remain upon the ramp until the arrival of the tractors that take them from the ramp, and draw them to the warehouse of the consignee, or to the freight terminal in case of mixed loads. On the return movement, the tractor places the railwagon on the ramp and then leaves it for the train crew to load on flat car. Thus there is no dead time for either men or equipment.

Inasmuch as railwagons are equipped with a standard type of fifth wheel, the tractors of practically any local cartage company are available for hauling them. A standard type of "dolly" may be used to convert a railwagon into a four-wheeled trailer, thus permitting moving two railwagons with one tractor.

In the Cleveland-Toledo operation, the flat car is not operated over the railways of either city. It is stopped at the limit of each city at which point the ramps for automatically unloading the railwagons are located. From these ramps tractors leased from local cartage companies, draw the railwagons to and from the premises of the customers. In moving railwagons in and out of the city, two railwagons are drawn by one tractor. There is naturally a tractor expense involved in transporting these railwagons from the city limits to the business center of the city. This, in part, is offset by eliminating the cost of operating freight cars over city railways and by eliminating mileage and expense of switch crews.


Railwagons of this type have proved to be extremely efficient in the movement of small shipments between Cleveland and Toledo

As a result of tests made between Cleveland and Toledo over an operating period of four months, the following conclusions have been reached: the railwagon is as efficient and flexible as the present type of trailer for operation over the highway and for use in city cartage work; it can be transported over the rails at less cost per mile than the present type of highway trailer can be moved over the highway; the railwagon is practically the equivalent of the steam railroad side track into industrial plants; its use has eliminated warehouse expenses, reduced clerical costs and pick-up and delivery costs as well as loss and damage claims.

Three railwagons mounted on one railway car have 50 per cent greater carrying capacity than that of the average box car. Two flat cars with their complement of six railwagons are, therefore, equivalent to three of the present type box cars. The use of railwagons thus reduces freight rail car-miles one-third with a corresponding decrease in railway operating expense. The door-to-door service that has been made possible by the railwagon service has enabled the Electric Railways Freight Company to obtain business that has not been available since the development of the motor freight truck lines.

Judges of the "Electric Railway Journal" Maintenance Contest in session at the American Electric Railway Association headquarters to consider entries submitted during the first period.

Left to right: R. H. Dalgleish, chief engineer Capital Traction Company, Washington, D. C.; Arthur Baker, engineering secretary American Electric Railway Association; John A. Miller, Jr., editor ELECTRIC RAILWAY JOURNAL; W. W. Wysor, chief engineer United Railways & Electric Company, Baltimore, Md., chairman; Walter Quinn, electrical engineer Third Avenue Railway, New York City; Charles J. Roggi, ELECTRIC RAILWAY JOURNAL.

Maintenance Awards

Won by *Toronto, San Diego* and *Norfolk*

For the First Contest Period, the Prize in the Way and Structures Department Goes to W. J. McCallum, in Electric and Line Department to M. D. Schwegler, in Rolling Stock and Shops to Farrell Tipton, and in Department of Buses and Garages to C. B. Hall

INCREASED interest in ELECTRIC RAILWAY JOURNAL Maintenance Contest in the period ended Jan. 31, was indicated by the larger number of companies represented by the contestants, and by the larger number of items submitted. During no other previous period of the contest has there been a wider territorial distribution of contestants. That the contest is an effective means of bringing to light new and improved shop practices and of arousing the enthusiasm of the mechanic for his work is generally recognized by the electric railways throughout the country. The effort made by the men in writing their entries leads them to study their problems more critically. This thoughtful attitude of the men toward their work which is fostered by the Contest undoubtedly benefits both their own companies and their industry.

The wide geographical distribution of entries in this period of the contest is indicated by the items which the judges selected to receive awards in the four departments. From Toronto, from San Diego, and from Norfolk came the items which won prizes. Toronto made a notable achievement in winning two of the four prizes. This distinction has been achieved by only one other company in the past, the Cleveland Railway. Toronto's winners were in the way and structures and in the electrical and line departments. Numerous entries were received from the Pacific Coast, and from among these a San Diego entry emerged with a prize in the rolling stock department. In other previous contests representatives of the San Diego Electric Railway have also been found among the prize winners. For several years, Norfolk division of the Virginia Electric & Power Company has contributed numerous entries to the contest, and this time it went over the top by winning the award for the department of buses and garages. Among the other cities represented in the contest were Birmingham, Cincinnati, Detroit, Cleveland, Atlanta and Portland, Me.

Selection of four prize winners from among the many ideas submitted was made by the committee of judges.

Farrell Tipton

at a meeting held Feb. 13 at the headquarters of the American Electric Railway Association.

In the department of rolling stock and shops the prize was awarded to Farrell Tipton, San Diego Electric Railway, for "Buffer Refinishes Armature Cores," published in the February issue, page 101. C. B. Hall received the prize in the department of buses and garages for his entry "Bus Wheels Removed with a Simple Clamp," which appeared in December, 1930, on page 763. For his entry "Switch Recess Grinder," W. J. MacCallum, Toronto Transportation Commission, was awarded the prize in the way and structures department. The electrical and line department prize was awarded to M. B. Schwegler, Toronto Transportation Commission, for his "Long Graphic Charts Read with Ease." The last mentioned two items appear in this issue.

M. D. Schwegler

Farrell Tipton

WHEN Farrell Tipton was graduated from the high school in Payson, Utah, where he was born in November, 1904, he journeyed to the Pacific Coast to obtain his first job, which was as electrician's helper with the San Diego Electric Railway. After three months of this work young Tipton, for he was only 21 then, was transferred to the carhouse as control inspector. In 1926 Mr. Tipton again returned to the electrical department, this time as electrician and assistant armature winder. He remained in this capacity until 1929 when he was appointed chief trouble-shooter. His official title was and continues to be head electrician in charge of the meter testing department, electrical construction, car wiring and maintenance of shop and carhouse electrical equipment.

M. D. Schwegler

WALKERTON, Ontario, is the native town of M. D. Schwegler, and it was there that he attended the public and high schools. Young Schwegler was mechanically inclined, and when he received his high school diploma, there was no doubt in his mind what he wanted to do. He got his wish when he was offered an opportunity to join the staff of the Saugeen Electric Light & Power Company as operator and maintenance man. He continued in this work until 1902 when he traveled to Toronto to join a larger power group composed of the Toronto Power Company, the Toronto Railway and the Toronto Electric Light Company. For almost two decades Mr. Schwegler was connected with a great variety of work in the three companies, an admirable training for his future position. In 1921, he was appointed superintendent of power, in charge of operation and maintenance of substations, by the Toronto Transportation Commission when it purchased the property of the Toronto Railway.

C. B. Hall

FOLLOWING his graduation from a southern college of commerce and business administration, C. B. Hall entered the employ of a steam railroad. His stay in this field was brief, for after several months he joined the Norfolk division of the Virginia Electric & Power Company, bringing him near his native town of Portsmouth where he was born in 1896. His short previous railroad experience and his business school training, which embraced commercial law and journalism, served as a valuable background for his work as secretary to the superintendent of transportation. For twelve years Mr. Hall has served at Norfolk in the engineering, publicity and public relations, accounting, general management and maintenance of way departments. When the Norfolk division began to operate buses in 1925, he came in direct contact with maintenance of equipment, both cars and buses. At present he is assisting the superintendent of equipment. Mr. Hall won honorable mention in the JOURNAL'S Maintenance Contest in 1928.

C. B. Hall

W. J. MacCallum

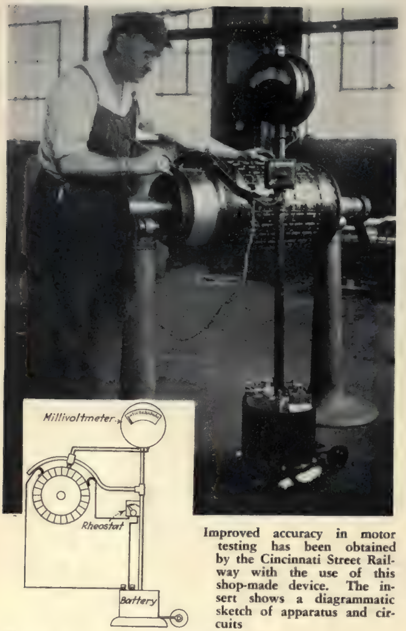
SINCE 1921 W. J. MacCallum has been in charge of the frog shop, maintaining and repairing all special work for the way department, of the Toronto Transportation Commission. He was appointed to this position soon after he had joined the engineering staff because of his wide experience in this type of work.

At the age of 17 Mr. MacCallum started his mechanical career with the John Abel Company, Toronto, manufacturers of steam engines for threshing and electric light plants. At this time he laid the foundation for his future engineering work by combining his manufacturing experience during the day with a course in mechanical engineering at the Toronto Technical School. After this dual role of apprentice and student, he joined the Dodge Manufacturing Company, Toronto, as foreman of the fitting department. After three years of experience with power transmission machinery, and with elevator and conveying equipment, Mr. MacCallum joined the staff of the Chapman Double Ball Bearing Company, Toronto.

When the Chapman Double Ball Bearing Company began the manufacture of munitions in 1915, he was made general superintendent of the Toronto plant, and consulting engineer for the Chapman branch plant in the United States. He continued this connection until the signing of the Armistice when he was appointed works manager for the Gray Ball Bearing Company, Toronto. Three years later the Toronto Transportation Commission called him to join the Engineering Staff.

W. J. MacCallum

PRACTICAL IDEAS for the *Maintenance Man*



Improved accuracy in motor testing has been obtained by the Cincinnati Street Railway with the use of this shop-made device. The insert shows a diagrammatic sketch of apparatus and circuits

*Improved Armature Test**

By Roland Wright
Equipment Engineer
Cincinnati Street Railway

When the Cincinnati Street Railway made a determined effort to eliminate motor failures more accurate testing of motors when going through the repair shop was found to be necessary. As a result we assembled a tester from parts found about the shop to permit a quick and thorough routine test of all armatures.

The tester consists of a millivoltmeter mounted on a portable stand. At the base of the stand is a circular container which holds a storage battery. A rheostat and an adjustable arm to conduct the test leads to the commutator is mounted below the millivoltmeter. The test leads terminate in a small and convenient handle with two spring contacts at the ends. In testing a motor the arm is adjusted to the height of the commutator, and the test contacts are placed on adjacent bars. The voltage between bars is then indicated on the millivoltmeter. High meter readings indicate poorly soldered joints or cracked leads; very high readings indicate an open circuit. Low meter readings indicate a short circuit either in the coils or in the commutator. A reversal of polarity between adjacent bars indicates a wrong connection of the coil.

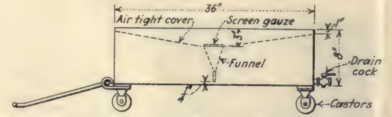
When this test was first adopted the usual transformer test was continued as a means of checking the accuracy of the millivoltmeter test. It was found that approximately 10 per cent of the armatures which were passed by in the transformer test showed defects when put through the millivoltmeter test. Defects thus found consisted of partly broken leads, partial short circuits, and leads that should be resoldered.

*Avoiding Gasoline Spills at Filling Stations**

By Charles Herms
San Diego Electric Railway

To prevent the waste and spilling of gasoline at filling stations a fireproof tank of galvanized iron, 16 gage, supported on small castors has been used by the San Diego Electric Railway. This tank is placed under the spout of the bus tank to catch the gasoline that would be spilled upon the floor when filling.

The spilling of gasoline is usually due to the small spouts in the gas tanks of buses. When filling a tank with gasoline from a high-pressure pump, the air in the tank cannot escape through the spout as fast as the gasoline enters. Therefore, as the gasoline is poured into the tank, it creates an air pressure which eventually becomes greater than the gasoline pressure to force the air out of the tank. In so doing, the air carries some gasoline with it. This air pressure increases as the amount of gasoline in the tank increases. When the bus tank is almost full the attendant must reduce the flow of gasoline or stop the supply entirely in order to allow the air to escape from the tank. This condition



This fireproof tank saves gasoline and eliminates a fire hazard when placed under the spout of a bus tank which is being filled

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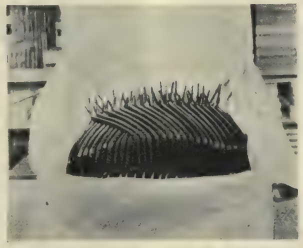
**Submitted in* Electric Railway Journal *Prize Contest.*

increases the time necessary to supply gasoline to a large fleet of buses, wastes a large amount of gasoline, and causes a serious fire hazard.

Use of the fireproof tank prevents waste of gasoline and eliminates the fire hazard. Before supplying a bus with gasoline this tank is easily and quickly pushed under the filling spout so that all the gasoline that will overflow from the spout will drip into the fireproof tank. When this fireproof tank is full it is emptied through a drain cock. The time of supplying gasoline to a bus has been reduced by 20 per cent since we have used this device.

Proper Storage of Insulated Materials Increases Service Life

By L. B. Schmerber
Materials and Process Engineering Department
Westinghouse Electric & Manufacturing Company



Small coils should be packed in wax paper for shipment and storage

COILS and insulating materials must be handled with care and stored under proper conditions, if the full benefit of a long useful life is to be obtained The practice of throwing spare parts carelessly into a bin and hanging coils on pegs in unsuitable places, where they are permitted to gather dirt and moisture, is rapidly passing away. Experience has proved that materials of this kind, if exposed to dirt, moisture and changing atmospheric conditions, will deteriorate much more rapidly than when properly stored.

A storage room should have good ventilation, normal humidity and a temperature several degrees above normal room temperature. Electrically generated heat is preferable in obtaining this temperature as there is less danger of accumulation of moisture than with a gas or steam heating system. The air in the room should be clean and fairly dry. The arrangement of the materials should be orderly and systematic so that they will receive a minimum amount of handling.

Coils and other materials which have been received from the manufacturer properly packed should be stored in the original packages. The containers should be plainly marked for identification of their contents. All insulating materials should be wrapped in waxed paper, packed in excelsior or paper, and sealed in paper cartons for being placed in storage. Treated cloth, mica tapes in rolls and all such material should be kept in closed tins.

The same general conditions that are suitable for insulating materials are also suitable for storing armature coils. Coils that are sufficiently small to make such procedure practicable should be packed and stored in sealed cartons as mentioned above for insulating materials. Larger coils should be housed in wooden boxes or crates, individually or by twos or threes, depending on the size of the coils and the condition of the shipment. Slot portions should be blocked and clamped to gage size to prevent the wrappers from swelling or from being damaged. The coils should first be wrapped on the straight parts with paraffined paper and the ends taped with cambric tape, which is removed when the coil is placed in service.

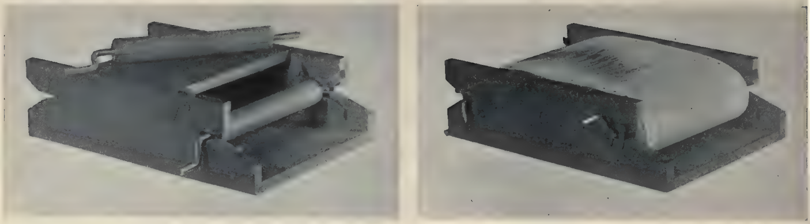
Small coils in storage which are not blocked and clamped should be inspected every few years. If the varnish coating begins to deteriorate or crack, the coils should be given an additional coat of varnish, preferably a plastic varnish.

When it is desired to store large armature coils as spares for a comparatively long period, they are prepared specially so that they will be in satisfactory condition for use when needed. Coils in this class are insulated with mica folium and specially treated tape or mica tape.

This preparation consists of a protective covering to preserve the insulation. First, a layer of strong cotton tape is applied over the entire insulated coil including leads. Then a layer of prepared tape is applied over all and a liberal coat of moistureproof varnish applied to this. Another duplicate layer of this prepared tape is applied and varnished as before, thus giving a double protection to the coil from moisture and dirt. After this impenetrable protective covering has hermetically sealed the coil, treated hardwood strips are firmly clamped on all four sides of the slot portion. Then the coils are firmly blocked and braced in moistureproof packing cases and shipped to storage. The shipping case should be removed from the car intact and stored under favorable conditions as recommended until ready for use. Under this method of preparation and storage, the coils should be satisfactory for use after a period of five years.

In general, the conditions outlined above should be maintained also for the storage of field coils. If they are too large or there are too many to warrant packing in cartons, they may be taped individually with a layer of heavy cotton tape, half overlapped. This will protect them from dirt and abuse in handling. They may also be stacked in rows and layers, using blocking between layers to relieve lower ones from the weight of those above, and carefully covered with tarpaulins. Cannon cloth treated with black plastic varnish is the recommended material for tarpaulins.

The number of spare parts recommended depends upon the type and size of equipment as well as the class of service for which it is used. The number of spare parts for railway motors, of which there may be a large number in service on one property, will not be the same as the number to be carried for large generators.



To read long graphic charts they are held by this device and wound from one roller to the other

Long Graphic Charts Read with Ease*

By M. D. Schwegler
Superintendent of Power
Toronto Transportation Commission

Long sections of graphic meter charts are unwieldy and awkward to read. To facilitate the reading of such charts a device has been used for many years by the electrical department of the Toronto Transportation Commission. The device consists of a support for two slotted wooden rollers, each roller having a crank by which the chart is rolled in the desired direction. The ends of the chart are inserted in the slots of the rollers. The chart is first rolled on one of the rollers. It is then rolled in the reverse direction to note the desired readings, such as the peak load and the time at which it occurred. After all the necessary information has been obtained from the chart it is rolled around one of the rollers and filed with it.

Switch Recess Grinder*

By W. J. McCallum
Foreman Frog Shop
Toronto Transportation Commission

Tongue heel recesses of solid manganese steel switches which have become worn beyond an allowable limit are repaired at Toronto by welding with $\frac{3}{16}$-in. coated rods of 14 per cent manganese content. Economy in reconditioning such switches is effected by working at night and without removing the casing from the street. To facilitate this work a portable recess grinding machine has been made.

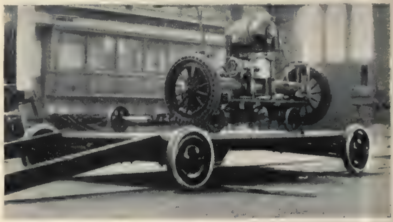
The grinder is mounted on a light truck having six frame tubes. Two of these tubes act as axles for the wheels, which are on eccentric sleeves for leveling purposes. The grinding wheel is driven by a 3-hp. motor. It is hand fed and may be shifted eccentrically in relation to the recess. The turntable is rotated by a small auxiliary motor. To set the machine in position for grinding, a locating plate is placed in the tongue recess. It is reset in the same manner after it has been removed to allow a car to pass. Tongues which have been worn undersize are repaired in the frog shop.

After welding worn heel recesses of manganese steel switches the built-up portion is finished with this grinding machine

Transporting Track Grinders on Trailers*

By R. T. Chiles
Master Mechanic
Cumberland County Power & Light Company
Portland, Me.

Track grinders are carried about the system of the Cumberland County Power & Light Company on a trailer built in the shops. In the past the track grinders were loaded into a crane car for transportation. With this method two crews were necessary, one crew for the crane car and the other for the track grinder.



The grinding crew in Portland tows its own grinder about the system by truck and trailer

The grinder is now loaded into the trailer with its own power and is towed by a 1½-ton truck operated by the grinding crew, the crane car crew being eliminated.

The trailer is equipped with a run-off with two rails at standard gage for loading the grinder from the street track. The platform on the trailer is 6x10 ft., and the wheelbase is 116 in. Other details of the trailer are: Wheel tread, 88 in.; weight, 1,600 lb.; height from top of rail in street to top of deck, 19½ in. The run-offs are

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*Submitted in Electric Railway Journal *Prize Contest.*

constructed of oak planks, 6 in. x 2½ in. x 10 ft., reinforced with angle iron 2x2½x5/16 in. The body is constructed of four 3-in. I-Beams spaced 22½ in. and bolted to two steel plates ¾x4½ in. The axles are made of wheel spindles joined together by two 4-in. channel irons. The track on the trailer is made with 2x1x¼ in. channel iron. The draft rigging is V shaped and constructed of 2 2x2x3/16-in. angle iron, 6 ft. long.

Aluminum Foil Tried on Car Roof

By C. P. Westlake
Superintendent of Equipment
Eighth and Ninth Avenues Railway, New York

Grease drippings from the elevated railways have no effect on the aluminum foil roof of this car. Furthermore, the grease can be easily removed with kerosene

CONTINUOUS exposure to the weather and operation beneath an elevated structure greatly reduced the service life of the canvas tops on our cars. Weather exposure caused the painted canvas roofs to crack and disintegrate, and grease drippings from the elevated structure would make a new canvas top grimy in a short time. To reduce the resulting heavy maintenance on car roofs we decided to try an aluminum foil roof surface.

With the aid of the Aluminum Company of America, we equipped one of our cars, as it was going through the paint shop, with a 0.004-in. Alcoa foil, obtained in strips 18 in. wide. The canvas was repaired and any loose paint was scraped off. A foiling adhesive, Tec-Pro No. 2, was brushed on the canvas top, and, as soon as the adhesive compound was absorbed by the canvas, the foil was laid. Starting at the outer edges of the roof, the strips were laid lengthwise, overlapping each other by 1½ in. As each strip of foil was laid, it was rolled smooth with a rubber-covered roller. That part of the strip which overlapped a previously laid strip was given a coat of foiling adhesive No. 1 and then again rolled down with the roller. The side roof and vestibule bonnets were covered with foil in the same manner. When all the aluminum foil had been laid, the excessive adhesive compound was removed with kerosene, and, as a result, the roof appears to be covered with a solid sheet of aluminum.

The work of laying the aluminum foil on the roof was completed by two men in 1½ hours. The car has been in service since August, 1930, and the aluminum foil top has been found satisfactory and practical. As a result of this experience we believe that a roof covered in this manner will better withstand weather exposure. The roof can now be easily cleaned of grease by kerosene. The short experience we have had with the operation of this car in summer has led us to believe that the aluminum foil surface will also make the cars much cooler by keeping out the heat of the sun's rays.

Pulling Up Rails in Open Track*

By James J. Burns
Road Master
City of Detroit, Department of Street Railways

SUBSTANTIAL economy in the removal of old rails in open track has been effected by the use of a yoke consisting of two sections of rail 15 ft. long, held together by a steel plate about 2 in. thick. At one end the rail sections are bent upward, serving as runners for the yoke. To pull up a section of old rail the yoke is slipped under one of the ends and pulled along the rail by a truck. The runners hold the ties down to the ground and the cross-member detaches the rail. This yoke was constructed in our shops at a total cost of $50.

A yoke of sections of old rails pulls up old track economically

Recently a section of double track with old wooden ties and mastic pavement was built along Grand River Avenue for a distance of a half mile. In the cost estimate of this job $500 was allowed for pulling up the old rails from the roadbed with hand labor. By the use of the yoke and a 5-ton truck, the rails of the section were pulled up in two hours at a cost of $20. This figure includes cost of incidental labor.

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*Submitted in Electric Railway Journal *Prize Contest.*

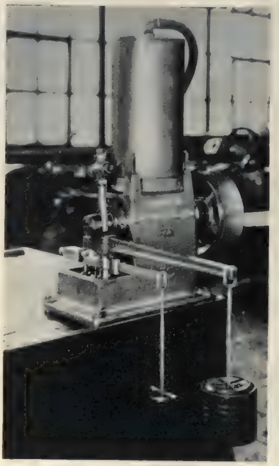
NEW PRODUCTS
for the Railways' Use

Laboratory Tester of Lubricants Available for the Shops

QUALITY and efficiency of lubricants and bearing metals under various conditions of load can be accurately determined with a testing apparatus just put on the market by the Timken Roller Bearing Company.

The apparatus consists of a cast-iron base which supports the testing mandrel, two levers and a container holding a gallon of the lubricant on test. The tank is mounted above an electric heater, which can heat the oil to a temperature of 210 deg. F. The oil flows over the test piece to a sump in the base, and its rate of flow is adjusted by a valve in the line. From the sump, the oil is forced back to the tank by a small pump in the base driven from the testing mandrel. Driven by a variable-speed motor the mandrel is rigidly held in alignment by two Timken bearings and is tapered at the test end to receive the tapered cup of a bearing. This cup forms one of the test pieces and is held in place firmly by a nut on the threaded end of the mandrel.

Two levers, one above the other, form the heart of the apparatus. The upper is the load lever, the lower one being the friction lever. The upper lever carries the test block and is pivoted on a knife edge in the lower lever, which is also pivoted on a knife edge and has a stop at the unloaded end. With this arrangement the test block is parallel to the revolving cup, and the unit loading over the length of both pieces is constant. A small piece of metal, $\frac{1}{2}$x$\frac{1}{2}$x$\frac{3}{4}$ in., hardened to Rockwell C-60 and ground, forms the test block. It is inserted in a notch in the load lever and is held in place by a wedge. For testing bearing metals both the test block and the cup can be made of appropriate material. The friction lever has a vernier scale and a sliding weight for accurate measurements. Both levers are equipped with hangers for adjustable weights. A welded steel housing covers the ends of the mandrel and levers.



Efficiency of different bearing metals under various conditions of load, speed and temperature can be accurately determined with this apparatus

With both test pieces in place, the driving motor or line shaft is raised to the desired speed, and the heated lubricant is allowed to flow over the test block. The load lever is then loaded by weights to obtain the desired pressure between the test pieces. A chart is furnished with the apparatus to indicate the necessary weights per 1,000 lb. pressure. If only the load capacity of the oil is to be determined, the test block is removed after 30 minutes and examined for signs of scuffing. The degree of scuffing indicates load capacity of the lubricant. If the coefficient of friction of the lubricant is desired, weights are added to the friction lever until it moves away from the stop. By loading the upper lever, friction moves the test block horizontally forward, unbalancing the friction lever until it rests on the stop. The system may be balanced again by adding weights to the friction lever.

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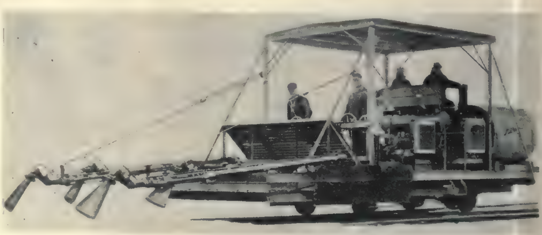
Wide-Range Weed Burner

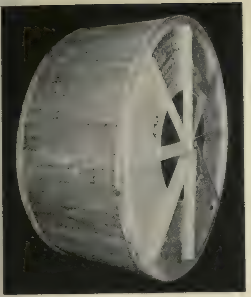
WEED burners, with two burners on each of two long arms which swing out to the side to reach fills, cuts and ditches, are offered by Fairmount Railway Motors, Inc., of Fairmount, Minn. One man easily controls one arm, raising or lowering it to follow the profile and contour of the ground as the car moves along without stopping. On level ground, the maximum reach of the flame is 23 ft. from the center of the track. The two burners on each side cover an 8-ft. strip at their widest angle, and are easily swung to any intermediate position within the 46-ft. burning range.

The car is driven by a gasoline engine which is equipped with an Autolite electric starter. Front and rear electric headlights are available for deadheading at night.

The track area can be burned by swinging the arms directly behind the car and staggering the two burner nozzles on each to cover opposite sides of each rail. The main oven is used for burning weeds at a fast rate. For melting ice and snow around switches, extension burners are used so that the car can stand still or travel as slowly as necessary.



Swing burner flames have a maximum range of 46 ft.



To return shipment, lags are removed in five or six minutes and placed loosely in the reel drum

Steel Reel Reduces Cost of Cable Transportation

NO HEAVIER than the corresponding size in wood, a steel reel is manufactured by the Henry B. Newhall Corporation, Garwood, N. J., that is stronger and that can stand transportation and field handling without injury to the reel or cable. Stiff and rigid, the steel reel prevents frictional, compression and bending stresses on the cable which might injure the lead sheath or the insulation. No nails are used in the reel or lagging.

The wood method of holding the lags enables one man to remove them in five or six minutes and to return shipment of the lags by placing them loosely inside the reel drum instead of bundling. It is claimed that the reel cost per trip is much less than for wood, and that the steel reel saves time and labor in field work with greater safety to the men. Loads of 100,000 lb. on a single reel have been successfully transported.

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One-Man-Operated Loader

EQUIPPED with a 30-hp. gasoline engine or a 20-hp. electric motor of standard specifications, the "Grizzly" loader, manufactured by the Link-Belt Company of Chicago, has a rated capacity of 1¾ cu.yd. per minute, with uniform speed based on sand, stone or gravel, 1½ in. or smaller. Larger material can be handled at a smaller capacity.

The loader can travel forward or reverse, and turn right or left when traveling either way. Hand levers control the starting, turning and stopping of the crawler, and automatically set the brakes when stopping. A separate hand lever controls the elevator, which is disengaged automatically when the crawler is started in reverse.

The feeder is a cast steel spiral which digs, lifts and conveys the material to the buckets, cutting a swath of 7 ft. 7 in. wide. Thirty-five malleable-iron buckets, with reinforced edges to reduce wear, convey the material to a chute at the discharge end of the elevator. Standard equipment includes a swiveling elevator chute which can turn through an angle of 180 deg., controlled from the operator's platform. The chute has a renewable liner plate.

By releasing the lower guides, the elevator boom can be collapsed from digging position without manual labor. One man can easily restore it to digging position by pulling down the lower end and replacing the lower guides.

Birmingham Electric Company loads ballast into dump car with "Grizzly" crawler loader

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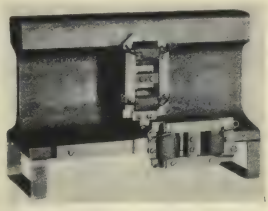
Rail Strains Measured Instantaneously

A MAGNETIC gage, still in process of development by the Westinghouse Electric & Manufacturing Company, measures strains in rails and discloses their locations. Readings of the gage are instantaneous and visual. Tests were made of stresses changing at high rates of frequency. Stresses have been recorded at the rate of 30 per second, but this figure can be increased by speeding up the movement of the film of the oscillograph on which the curves are shown.



Westinghouse is developing a delicate magnetic gage for ready detection of strains in rails

Photographs of charts made on rails showed how eight readings were made and recorded simultaneously on the head and the base, inside and outside of each rail. These curves not only indicated the passing of each wheel of a train, but illustrated the lateral forces exerted by the flanges of those wheels as well as the vertical forces of the weight.

One graph indicated plainly that a certain locomotive with five driving wheels was too long to be safe on a curve of certain sharpness, and that its length and rigid construction exerted a tendency to turn the outer rail over on its side.

Gages on the rails also disclose the lateral oscillation of cars by recording the impact and blow on the side of the rails. It is also adaptable for similar studies of bolts, plates and joints, and it is possible that the design of a better and safer type of rail will be indicated by a series of observations with the new gage.

The gage is about 8 in. long, with bolt holes in the two ends. The center section has two coils. A moving armature is adjustable within narrow limits, and the slightest movement of this armature between the pole pieces changes the air gap across which the flux must pass from the two pole pieces to the armature.

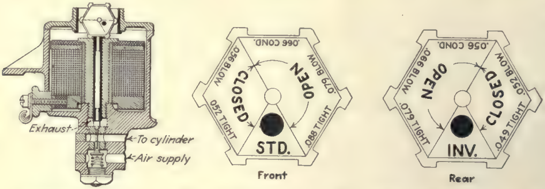
Three wires carry the current through the gage and either to the recording instrument or to the oscillograph, where readings can be made or photographs taken as desired. The changes in the length of the air gaps upset the balance of the voltage across the gage coils and indicate the strain in the rail at the point to which the gage is attached.

Gage to Adjust Air Gaps of Magnet Valves

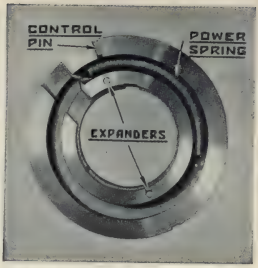
MAGNET valves of electro-pneumatic control equipment must have the correct air gap to prevent sluggish action. With an excessive air gap, the valve may fail to operate. With an insufficient air gap, residual magnetism may cause sticking of the armature and core, thus preventing the operation of the valve. Burning and other serious consequences may be the result.

To facilitate the adjustment of the air gaps, a molded six-point magnet valve gage has been developed by the Westinghouse Electric & Manufacturing Company for valves using standard length stems. One side of the new gage contains information relative to "standard" valves, while that on its reverse side pertains to "inverted" type valves.

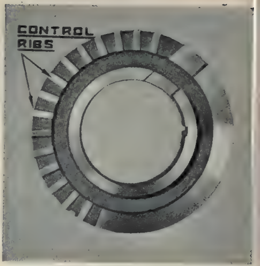
When checking the air gap, both the cover and armature must be removed, but the usual supply of air must be available to operate the valve. By inserting this gage in the top of the valve directly over the stem, its action at "open" and "closed" positions can be checked.



A six-point molded gage suitable for both standard and inverted magnet valves will facilitate adjustment of air gaps



Spring in groove of the smooth-faced cam rotates the cammed members



Control ribs of the slotted cam govern the readjustment of the compensator

Automatic Clearance Compensator for Adjustable Bearings

CONSTANT clearance in bearings is automatically maintained by a compensator designed by the Wyrick Engineering Company, Wyandotte, Mich. It is stated that by taking up any lateral movements between the parts, this compensator prevents pounding action and prolongs the life of the bearing. Hence necessity of machining to close limits is eliminated, and lighter bearings may be used. The compensator can be adapted to machine tool bearings, journal bearings, worm drive axle bearings and wheel bearings.

The compensator has two mating helical cam-faced members which will increase or decrease the joint cross-sectional dimensions when placed together and rotated in opposite directions. These two members serve the space fillling requirements that are necessary as wear occurs, being rotated by a spring attached to both.

Two hardened steel balls with expansion springs forcing them outward exert a force against the inner surface of the slotted cam. As the bearing wears the two cam faces are forced farther apart.

A T-shaped control pin is ground to project beyond the face of the smooth cam, in which it is assembled, a distance equal to the maximum clearance required. When the cams are in place the control pin projects into one of the slots of the slotted cam and engages one of the ribs. This prevents any rotation between the cams, if the maximum separation of the faces is less than the pin projection.

The control ribs of the slotted cam are spaced to allow for the desired degree of readjustment required at each adjustment period. The compensator is provided with a locking seal, which holds the cams in their reduced dimension until the compensator is properly assembled in working position, after which it is removed. The compensator acts as a precision spacing washer. Readjustments are made only when the clearance of the assembly exceeds the maximum.

Case of compensator removed to show action of control pin with control rib

As the compensator is placed between two spaced parts, the spring urges opposite rotation of the two cams. Such rotation is restrained by a rib obstructing passage of the control pin. The expanders tend to separate the cam faces and as wear begins space is provided for the cams to separate gradually until the control pin can clear the obstructing rib. Then the spring forces opposite rotation to close the space between the cam faces, thereby compensating for the increased clearance until further wear permits another adjustment.

Monthly and Other Financial Reports

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
Market Street Railway, San Francisco, Cal.					
January, 1931........	738,092	641,519*a*	....	96.573	45,011
January, 1930........	781,528	674,048*a*	....	107,480	51,347
12 mo. end. Jan., 1931	9,152.904	7,789,693*a*	....	1,363,211	713,901
12 mo. end. Jan., 1930	9,582,008	8,029,052*a*	....	1,552,956	846,916
Northwestern Pacific R.R., Sausalito, Cal.					
December, 1930.....	312,319	427,280	37,940	*152,903c*	*158,491e*
December, 1929......	304,207	444,614	37,320	*87,763c*	*90 759e*
12 mo. end. Dec., 1930	5,555,533	5,072,599	433,754	48,801*c*	*58,045e*
12 mo. end. Dec., 1929	6,186.763	5,384,887	449,434	351,993*c*	299,726*e*
Capital Traction Co., Washington, D. C.					
December, 1930......	369,885	242,479	31,742	101,354	67,651
December, 1929......	377,088	259,420	23,894	99,168	67,240
12 mo. end. Dec., 1930	4,164,521	3,006,014	324,652	858.348	489,339
12 mo. end. Dec., 1929	4,296,905	3,067,371	327,591	928,811	561,974
Capital Traction Co., Washington, D. C.					
January, 1931........	347,491	253,454	27,060	69,576	37,705
January, 1930........	358,439	262,565	27,524	70,980	39,750
Jacksonville Traction Co., Jacksonville, Fla.					
December, 1930......	89.903	70,326	4,510	14,477	....
December, 1929......	101,549	76,474	8,075	16,393	....
12 mo. end. Dec., 1930	1,031,276	844,817	92,975	87 423	*63,204*
12 mo. end. Dec., 1929	1,141,139	928,589	108,890	97,533	*60,421*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
December, 1930......	89,787	53,292	9.074	28,424	16,501
December, 1929......	88,283	51,125	7,888	29,199	17,869
12 mo. end. Dec., 1930	1,036,653	617,520	107,977	325,543	182,665
12 mo. end. Dec.. 1929	1,052,273	608,420	105,832	350,927	213.720
Illinois Terminal Company, Springfield, Ill.					
December, 1930......	577,425	394,018	27,969	155,438*c*	127,588*e*
December, 1929......	668,935	438,696	53.533	176,706*c*	120,751*e*
12 mo. end. Dec., 1930	7,490,935	5,198,237	364,823	1.927,747*c*	1,451,088*e*
12 mo. end. Dec. 1929	8,154,358	5,651,739	312,061	2,190,425*c*	1,605,289*e*
United Railways & Electric Co., Baltimore, Md.					
December, 1930......	1,350,553	904.241	139,074	318,016	36,700
December, 1929......	1,470,831	972,529	152,554	362,263	80,723
12 mo. end. Dec., 1930	16,160,513	....	....	....	....
12 mo. end. Dec., 1929	16,717,099	....	....	....	....
United Railways & Electric Co., Baltimore, Md.					
January, 1931........	1.268,536	881,130	113,281	287,527	7,388
January, 1930........	1,423,517	987,151	141,261	306,012	24,005
Boston Elevated Railway, Boston, Mass.					
December, 1930......	2,850,330	2,009,101	169,795	674,870	*20,516*
December, 1929......	3,105,111	2,030,450	100,801	978,710	286,824
Eastern Massachusetts Street Ry., Boston, Mass.					
January, 1931........	700,961	444,722	27,357	238,030	36,145
January, 1930........	758,812	448,284	37,755	282,360	82,456
Massachusetts Northeastern Street Ry., Haverhill, Mass.					
3 mo. end. Dec., 1930	42,711	39,042*a*	....	3,669	*10,287*
3 mo. end. Dec., 1929	51,785	79,694*a*	....	*27.909*	*41,866*
9 mo. end. Dec., 1930	193,692	152,476*a*	....	41,216	*14,713*
9 mo. end. Dec., 1929	269.451	279,055*a*	....	*9,604*	*65,734*
Middlesex & Boston Street Railway, Newtonville, Mass.					
mo. end. Dec., 1930	276,402	259,530*a*	....	9,657	*23,487*
mo. end. Dec., 1929	304,493	246.284*a*	....	49,676	10,149
1 mo. end. Dec., 1930	1,119,294	933,033*a*	....	151,495	*7,161*
1 mo. end. Dec., 1929	1,164,390	969,603*a*	....	160,856	4,489
Berkshire Street Railway, Pittsfield, Mass.					
mo. end. Dec., 1930	148,972	140,916*a*	....	15,036	*56,781*
mo. end. Dec., 1929	180,505	162,944*a*	....	10,144	*61,888*
1 mo. end. Dec., 1930	650,745	564.462*a*	....	83,796	*203,718*
1 mo. end. Dec., 1929	718,069	624,805*a*	....	86,748	*205,777*
Springfield Street Railway, Springfield, Mass.					
mo. end. Dec., 1930	588,565	468,496*a*	....	120,069	51,273
mo. end. Dec., 1929	681,844	445,922*a*	....	135,922	64,226
12 mo. end. Dec., 1930	2,420,496	1,951,825*a*	....	468,671	189,060
12 mo. end. Dec., 1929	2,719,696	2,220,309*a*	....	499,387	209.046
Worcester Consolidated Street Railway, Worcester, Mass.					
3 mo. end. Dec., 1930	664,383	539,545*a*	....	124.838	23,603
3 mo. end. Dec., 1929	778.442	619,446*a*	....	158,996	49,244
12 mo. end. Dec., 1930	2,788,361	2,169,884*a*	....	618,477	205,032
12 mo. end. Dec., 1929	3,068,690	2,429,675*a*	....	639,015	184,050
Department of Street Railways, Detroit, Mich.					
January, 1931........	1,550,656	1,356,347	65,228	164,518	12,759
January, 1930........	2,165,113	1,810,502	65,090	297,796	149,123
12 mo. end. Jan., 1931	20,509,329	17,418,600	774,700	2,462,993	720,801
12 mo. end. Jan., 1930	26,209.568	20.907,042	753,494	4,654,066	2,981,856

	Operating Revenue	Operating Expenses	Taxes	Gross Income	Net Income
Kansas City Public Service Co., Kansas City, Mo.					
December, 1930......	758,045	570,065*a*	....	187,980	108,444*d*
December, 1929......	771,361	667,443*a*	....	103,918	28,072*d*
12 mo. end. Dec., 1930	8,377,152	7,048,230*a*	....	1,328,922	385,677*d*
12 mo. end. Dec., 1929	8,951,616	7,327,003*a*	....	1,624,612	698,223*d*
Brooklyn-Manhattan Transit System, New York, N. Y.					
January, 1931........	4,852,706	3,131,718	343,612	1,449.674	674,029
January, 1930........	5,134,097	3,383,386	353,454	1,492,345	715.528
7 mo. end. Jan., 1931	34,299,499	22,249.389	2,333,393	10,197,141	4,789,874
7 mo. end. Jan., 1930	35,544,051	23,805.477	2,253,662	10,001,305	4,566,659
Brooklyn & Queens Transit System, New York, N. Y.					
January, 1931........	1,849,644	1,432,343	108,892	323,361	197,355
January, 1930........	1,971,577	1,550,153	117,113	325.940	191,390
7 mo. end. Jan., 1931	13,144,850	10,240,311	745,196	2,260,097	1,389,020
7 mo. end. Jan., 1930	13,907,132	10,969,673	800,103	2,287,687	1,403,534
Hudson & Manhattan R.R., New York, N. Y.					
January, 1931........	1,005,022	512,350*a*	....	492,671	157,098
January, 1930........	1,087,684	552,211*a*	....	535,473	200,855
Interborough Rapid Transit Co., New York, N. Y.					
January, 1931........	6,123,645	3,873,110	665,723	1,584,811	*348,978*
January, 1930........	6,407,365	3,885,013	210,552	2,311,829	*210,329*
7 mo. end. Jan., 1931	41,132,537	27,080,452	1,868.138	12,183,946	*2,169,064*
7 mo. end. Jan., 1930	42,157,170	26,381,006	1,412,955	14,363,208	*1,139,508*
Long Island R.R., New York, N. Y.					
December. 1930......	2,905,045	1,950,261	179,921	774,497*c*	596,812*e*
December, 1929......	3,110,284	2,410,946	152,249	545,140*c*	405,711*e*
12 mo. end. Dec., 1930	39,596,434	26,105,925	3,453,370	10,025,730*c*	7,995,447*e*
12 mo. end. Dec., 1929	41,326.194	27,734,679	2.922,226	10,649,328*c*	8,707,943*e*
New York Railways Corp., New York, N. Y.					
December, 1930......	461,228	414,075*a*	....	47,153	7,716*b*
December, 1929......	475,838	435,442*a*	....	40,396	*20,499b*
12 mo. end. Dec., 1930	5,545,287	4,969,255*a*	....	576,032	95,523*b*
12 mo. end. Dec., 1929	6,171,668	5,440,358*a*	....	731,310	1,050*b*
New York, Westchester & Boston R.R., New York, N. Y.					
December. 1930......	190,136	142,533	*3,941*	52,711	*205,029*
December, 1929......	216,830	142,343	26,437	49,108	*246,249*
12 mo. end. Dec., 1930	2,485,395	1,521,839	272,554	701,453	*2,093,425*
12 mo. end. Dec., 1929	2,530,488	1,570,218	275,817	696,912	*1,970,935*
New York, Westchester & Boston R. R., New York, N. Y.					
January, 1931........	182,249	137,690	23,110	21.449	*220,394*
January, 1930........	211,323	122,641	24,309	64,373	*166,494*
Staten Island Rapid Transit Co., New York, N. Y.					
December, 1930......	178,474	144,723	15,992	17,659	5,997
December. 1929......	196,274	90,670	18,442	87,156	77,226
12 mo. end. Dec., 1930	2,448,959	1,829.710	207,492	409,737	298,132
12 mo. end. Dec., 1929	2,637,897	1,892,347	210,242	535,285	460,515
Third Avenue Railway System, New York, N. Y.					
January, 1931........	1,393,054	1,084.327	94,470	237,453	*1,594*
January, 1930........	1,467,896	1,200,523	96,657	195,719	*43,647*
7 mo. end. Jan., 1931	9,869,762	7,628,259	660,108	1,749,151	74,155
7 mo. end. Jan., 1930	10,350,016	8,434,054	670,430	1,421,713	*253,858*
New York State Railways, Rochester, N. Y.					
3 mo. end. Sep., 1930	1,642,003	1,965,745*a*	....	*291,758*	*660,782*
3 mo. end. Sep., 1929	2,037,594	2,405,673*a*	....	*220,492*	*593,658*
9 mo. end. Sep., 1930	5,795,238	5,798.045*a*	....	*92,409*	*1,013,809*
9 mo. end. Sep., 1929	6,858,698	6,110,885*a*	....	823,876	*298,642*
Lethbridge Municipal Railway, Lethbridge, Alta.					
11 mo. end. Nov., 1930	49,197	44,599	....	4,598	*23,835*
11 mo. end. Nov., 1929	....	....	....	....	*18,400*
British Columbia Electric Ry., Vancouver, B. C.					
November, 1930.....	1,239,683	772,174	....	467,509	....
November, 1929.....	1,270,921	844,444	....	426,477	....
5 mo. end. Nov., 1930	6,085,721	....	....	2,174,817	....
5 mo. end. Nov., 1929	5,995,951	....	....	1,946,404	....
Saskatoon Municipal Railway, Saskatoon, Sask.					
11 mo. end. Nov., 1930	337,241	242,579	13,189	81,473	*40,417*
11 mo. end. Nov., 1929	....	....	....	....	8,235
Havana Electric Railway, Havana, Cuba					
3 mo. end. Dec., 1930	1,180,408	1,048,458*a*	....	134,636	*21,999*
3 mo. end. Dec., 1929	1,440,630	1,165,782*a*	....	283,594	123,136
12 mo. end. Dec., 1930	5,192,054	4,404,630*a*	....	805.032	173,362
12 mo. end. Dec., 1929	5,694,051	4,608.568*a*	....	1,116,940	473,580

Italic figures indicate deficit: *a* Includes taxes. *b* Before interest on income bonds. *c* Net after taxes. *d* Before depreciation. *e* Net after rents. *f* Including Brooklyn & Queens Transit System.

NEWS *of the Industry*

LATE NEWS

Yonkers, N. Y.—The Third Avenue Railway has arranged to put one-man street cars in operation in Yonkers.

◆

San Francisco, Cal.—The Red Top Cab Company placed 140 new Chrysler-built taxicabs in service on Feb. 18, replacing cars previously on the streets. The expenditure involved was $150,000.

◆

Detroit, Mich.—The City Council has set Feb. 26 as the date for a hearing on the petition of Mark R. Hanna to place the Miller-Schorn plan on the ballot April 6. Mr. Hanna proposes to install central loading stations and underground passages to the sidewalks at his own expense, to be reimbursed by the Detroit Municipal Railway over a period of six years. Mr. Hanna's offer applies only to the Jefferson Avenue car line.

◆

Des Moines, Ia.—City Council members have voted against final passage of an ordinance which would require two men on every street car in Des Moines. They have also voted to table the matter indefinitely.

◆

Dayton, Ohio — Frank E. Currigan has been appointed receiver of the Dayton & Western Traction Company on the application of the Winters National Bank & Trust Company, Dayton, trustee, under an indenture made to secure $312,000 of 25-year bonds, of which only $3,500 have been retired.

◆

Los Angeles, Cal. — Seventy-eight trainmen, together with their wives, were guests of honor at a banquet, given by the management of the Los Angeles Railway on Feb. 6, which officially marked the successful conclusion of the third safety and courtesy campaign of 1930 ending Dec. 31, in which the trainmen reduced the number of accidents for October, November and December by 1,045—or 18.5 per cent—over the corresponding three months of the previous year.

◆

Des Moines, Ia.—Friday, Feb. 13, may have been "hoodoo day," but it brought good luck to the Des Moines Railway. For the first day in many years, not a single accident or incident was reported to the company's claim department. More careful driving by autoists on the jinx day was cited as reason for the unusual record.

◆

Brooklyn, N. Y.—For nearly six hours on Feb. 25 witnesses representing almost every district in Brooklyn and Ridgewood and Richmond Hill in Queens, listed reasons and described personal incidents to convey their arguments to Transit Commissioner Lockwood that the one-man trolleys of the B.-M.T. were unsafe or inconvenient for the transportation of passengers. The next hearing will be March 6. At that time the company will be heard.

(Late News Continued on Page 160)

Boston "L" $1,134,638 Behind 1930 Service Cost

Trustees of the Boston Elevated Railway have submitted their annual report to the Massachusetts Legislature. The company failed by $1,134,638 to earn the cost of service in 1930. The report says:

> In addition to the changing character of the riding noted last year, namely, the decline in Sunday, holiday and summer riding, the railway has been subjected to the effect of the severe economic depression. A transportation system such as the Boston Elevated quickly feels lessened general business activities, and the total receipts during the calendar year 1930 decreased $1,585,901.86 as compared with 1929—or 4.65 per cent.
>
> It is believed that owing to the fact that the service rendered by the Boston Elevated is a unified service of bus, car and rapid transit trains, the loss in riding has been less in Boston than has been general elsewhere. These figures seem to indicate the value of rapid transit as compared with surface line systems.
>
> During 1930 operating expenses have been further reduced by $496,772. The total operating expense for 1930 was $23,527,974, the lowest since 1922, although during this period, many items of operating expenses, including wages, have advanced, and 5,354,103 more miles were operated in 1930 than in 1922.
>
> The safety efforts mentioned last year in connection with the Brady award have been continued and improved as evidenced by the fact that all collision accidents on surface cars and buses have been reduced from 1.5 to 1.3 per 10,000 miles operated.
>
> The total cost of injuries and damages has been as follows: 1928, $1,502,313; 1929, $1,201,642; 1930, $1,108,584.
>
> Subway and tunnel rentals increased $124,873 during 1930 over the year previous. It should be noted that for the last year prior to public control, subway and tunnel rentals called for $991,551 a year, whereas for 1930 the charge was $2,775,244.
>
> The investment in road and equipment is $112,254,906 as compared with $112,787,510 on Dec. 31, 1929.
>
> Capital expenditures were less than the value of property retired from service during the year, the major item of which was the Harvard power station, sold to Harvard College on Feb. 28, 1930.
>
> During the year a new garage was constructed at Bartlett Street, Roxbury, for the bus lines in downtown Boston. In 1930 66 buses were added, all of the Metropolitan coach modern type, with increased seating capacity.

Coming Meetings

March 10-12—Oklahoma Utilities Association, Oklahoma City.

March 12-13—Annual Convention, Illinois Electric Railway Association, Springfield, Ill.

April 8-9—Central Electric Railway Master Mechanics' Association, Hotel Secor, Toledo, Ohio.

April 10—Maryland Utilities Association, Lord Baltimore Hotel, Baltimore, Md.

April 16-18—Annual State Convention, Missouri Association of Public Utilities, Excelsior, Mo.

May 4-7—International Chamber of Commerce, Washington, D. C.

May 14-15—Middle Atlantic States Equipment Men's Association, Washington, D. C.

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

Start Made on $2,500,000 San Francisco Program

The first work of the $2,500,000 program of construction and rehabilitation promised by the Market Street Railway, San Francisco, Cal., previous to the recent election, has been started. Sixty men have been put to work on the Sutter Street car line between Van Ness Avenue and Stockton Street. New 106-lb. rails will be laid and the new tracks will be all thermit welded. This will be the first all-thermit welded track in this system. The approximate cost of this reconstruction will be $100,000.

Bridge Project in Omaha Revived

The latest developments of the "free-bridge" situation in Omaha, Neb., and Council Bluffs, Iowa, indicate that the two cities may construct a new bridge, thereby revoking the escrow arrangement under which the Omaha & Council Bluffs Street Railway agreed to present its bridge to the two cities as soon as its price of $4,125,000 is realized from tolls.

The Omaha-Council Bluffs Missouri River bridge board of trustees entered into a contract with Robinson & Steinman, New York, for financing, planning and building a bridge at Farnam Street, one block from the railway's bridge. The escrow agreement with the railway will not be revoked until the new bridge is actually assured. Under a federal franchise which will expire June 1, 1931, construction must be begun by that time.

Representatives of the railway said that the company would do nothing to block the construction of the proposed bridge. An official speaking for the company, said: "The breaking of the escrow agreement will benefit the railway. We will have the bridge tolls for several years longer, if the construction of the Farnam Street bridge is begun."

South Bend's New $350,000 Freight Terminal

Three buildings on a 13-acre tract have been reconstructed by the Chicago, South Shore & South Bend Railroad. Two buildings were converted into freight houses, providing 10,000 sq.ft. of floor space; the third will be devoted to offices.

Containers being lifted from flat car to motor truck

Container Service Now in Effect on Ohio Interurban

In Ohio a group of trucking companies have organzied Cargo Transport, Inc., as a forwarding company using containers for the movement of freight over the lines of the Cincinnati & Lake Erie Railroad between Cincinnati and Toledo. The operation is relatively simple. Cargo Transport leases containers from Motor Terminals Company, of New York, containers which can be carried on trucks as motor truck bodies. Cargo Transport, furnishes a pick up service in Cincinnati, Dayton and Toledo, using the containers mounted on its trucks as bodies. The containers are hauled to the railheads, lifted off the trucks and placed on railroad flat cars (three to a car) by gantry cranes erected by the Motor Terminals Company. The containers are then hauled to destination by rail where operations are reversed, Cargo Transport providing a store-door delivery service. The truckmen now engaged in the operation claim that it cuts their operating costs in half; that whereas the intercity haul would cost them 30 cents a mile by highway, it costs them only 15 cents by rail. Railroad is able to handle the shipments under a favorable car-mile revenue with the virtual elimination of the heavy terminal expense involved in moving less-than-carload freight. The mechanical interchange of containers between trucks and flat cars reduces the rehandling of shipments.

Under a tariff filed with the Public Utilities Commission of Ohio by the Cincinnati & Lake Erie, the railway moves the containers under a minimum tariff of 30 cents per car mile. The rail company pays the Motor Terminals Company 25 cents per lift for use of the cranes in interchanging containers between flat cars and trucks. The only terminal expense to the railway is that involved in the spot and pull service in moving cars to and from gantry cranes at each end of the rail haul, plus 50 cents for loading two bodies at the point of origin, and 50 cents more for unloading the two bodies at distination, a total terminal expense of $1 per car aside from switching movements. The rates charged to shippers by the truck company includes pick-up-and-delivery service.

Over-night freight service is given under this plan between Toledo and Cincinnati, and second-morning delivery to Michigan and Kentucky cities. The service is being extended over the Eastern Michigan Railways to Detroit, and to other Michigan cities by motor truck over the highway because of the absence of rail facilities. Motor Terminals Company reports a present demand for 2,000 of its containers; 300 are already in use.

◆

Court Orders Full Service in Columbia

Twelve street car lines or the same system as operated by the Columbia Railway, Gas & Electric Company, Columbia, S. C., in 1925, were ordered re-established by the Supreme Court on Feb. 13.

Provision is made in the order for modifications or changes so as to require the operation of a full, adequate and satisfactory service. Such changes, it orders, may be legally made either upon written agreement of the parties concerned in the litigation or by petition to the Supreme Court, which said:

> Further this court intended to hold and did hold, that under the franchise contract with the city of Columbia, City Council had a right by ordinance to regulate the electric railway operations and service by respondents and said ordinances specifically require the operation upon regular schedules of all the lines leading to and from and within the city of Columbia.

The order further provides that the Broad River Power Company and the Columbia Railway, Gas & Electric Company must make a written report at each term of the court until otherwise ordered, as to the fulfillment of the court's order to the power companies.

The order of Feb. 13 is the result of a petition filed by the power companies on Feb. 4 and another by city attorneys.

The power companies asked the court if its original order was correctly interpreted by the re-establishment of three street car lines. The petition against the power companies asked that the companies be cited for contempt of court.

Attorneys for the companies say no further litigation is planned over the operation of the railway service, which was discontinued in 1927.

◆

Rapid Transit Assessment Plan Contested

When the office of the clerk of the superior court in Chicago closed on Feb. 20 objections had been filed against nearly all of the 5,500 items on the special assessment roll for the State Street subway, according to an estimate made by the Property Owners committee on special assessments which is opposing the special assessment manner of financing the project. The objecting property owners now have until March 2 to specify grounds for contesting the assessments. Superior Judge Mangan will begin hearing the objections on March 12. Attorneys representing the committee contend that the subway is a general, rather than a local, improvement and that the assessments are too high.

◆

Effective Supervision in Cincinnati

Motor coach operation of the Cincinnati Street Railway has improved in the past several months under new motorized supervision. Road calls have been reduced and the supervisors have been able to handle coach operations more efficiently than heretofore.

Two Ford coupés are used in this service by four supervisors working in two shifts, the first from 6 a.m. to 2 p.m., and the second from 2 p.m. until 12 o'clock, midnight. Each supervisor reports to the chief dispatcher every hour if practicable to obtain information on the service, to give his location, and to indicate where he may be reached during the next period.

Each supervisor's car carries tools for emergency coach repairs and a box of salt to keep routes open during snow and sleet.

Cincinnati motor coach supervisors—left to right: John Kufer, Bob Lemmons, Herbert Boner and Kenneth Armstrong

LATE NEWS

(Continued from Page 158)

Pittsburgh, Pa.—A total of 1,428 trainmen of the Pittsburgh Railways operated their cars during 1930 without having a chargeable accident.

◆

Staunton, Va.—Officially told to comply with franchise requirements by starting within 30 days work aimed at putting lines and equipment in first-class condition, the Shenandoah Traction Company has notified the City Council that the expenditure would not be justified, but has indicated that the use of buses holds forth promise.

◆

San Francisco, Cal.—The Market Street Railway has been authorized by the supervisors to use the Municipal Railway tracks on Market Street between Jones and Gough Streets, while the Market Street company rebuilds its track over the 2,500-ft. section. The municipal tracks are not to be used in the rush period between 3 and 7 p.m. Compensation is at the rate of 10 cents per car-mile. About 200 men will be employed in an effort to complete the work within 40 days. Work will be started soon.

◆

East Chicago, Ind.—A bill introduced in the House would give the Public Service Commission jurisdiction in relocation of rights-of-way of electric railways. Should the bill be passed it would have a particular effect here since the Chicago, South Shore & South Bend Railroad is now attempting to remove its tracks from Chicago Avenue, the main street of the city, to a private right-of-way. The move has been consistently opposed by the local City Council, but was approved when the case was taken to the Public Service Commission by the South Shore. Later, the Circuit Court ruled that the commission had no jurisdiction. The matter is now in the process of being appealed to a higher court by the South Shore.

◆

Victoria, B. C.—Co-operating with the Retail Merchants' Association in a "Dollar Day" shopping drive, the British Columbia Electric Railway furnished free transportation on all its city lines on the city-ward trip from 10 to 11 o'clock on a recent Saturday morning.

◆

Oakland, Cal.—In accordance with a verbal agreement made with city officials some time ago, H. P. Bell, vice-president of the Eastbay Street Railways, Ltd., has informed the street department that the company intends to pave the track location in East Eighth Street and Fifth Avenue, where the old street car tracks will be abandoned and bus service installed instead. The company's announced intention is to abandon the Fifth Avenue and East Eighth Street line, from Franklin to East Fourteenth Street, and to remove all rails, poles and wires along the route.

◆

Pittsburg, Kan.—The Joplin & Pittsburg Railway on Feb. 20 asked the Kansas Public Service Commission for authority to abandon 2¼ miles of lines here, to discontinue service in the city and to take up the tracks.

Oakland, Cal.—Key System, Ltd., has been authorized by the Railroad Commission to construct a lead track at grade across 34th Street, 22nd Street and Fourteenth Street here to serve industries in the Oakland Harbor district.

◆

Kansas City, Kan.—A bill authorizing the city to pave and improve between tracks of the Kansas City Public Service Company on arterial traffic ways in the city, and charge the cost against the company has been introduced in the Kansas House of Representatives. All of the costs would be a first lien on railway property.

◆

Harrisburg, Pa.—Shiremanstown Borough Council has decided to ask the Valley Railways to change its plans for substituting buses for street cars on parts of the West Shore. To this end, Arthur Rupp, one of the councilmen, has been authorized to confer with railway officials in an effort to have the car tracks retained as far west as Shiremanstown instead of having trackage torn up from Mechanicsburg east to Eichelberger's Curve, at the intersection of the Gettysburg Pike, the Simpson Road and 32d Street, Camp Hill.

◆

San Francisco, Cal.—Ray W. Taylor, claims adjuster of the Municipal Railway, and his three assistants, James Robinson, Thomas Johnson and Moses Selig, have been removed from their positions. The Board of Public Works rescinded the original appointments.

◆

Kansas City, Mo.—A bill placing urban bus lines under the supervision of the Public Service Commission has been reported favorably by the House judiciary committee. Sponsors of the measure contend motor passenger carriers, operating over fixed route more than half of which is inside corporate limits of cities should be placed on the same basis as railway systems. The commission would have power to regulate rates, schedules and routes of the city bus lines, and require issuance of a certificate of convenience and necessity to operate.

◆

New York, N. Y. — Bids will be opened on March 10 for the purchase and demolition of the East 34th Street elevated spur, running from Third Avenue to the East River. Opened in 1880, the spur outlived its usefulness and service on it was discontinued last July, when the city acquired title to the property.

◆

San Diego, Cal.—The City Council has postponed action on application made by San Diego Electric Railway for a franchise to operate a bus line between connection with car lines at Euclid Avenue and University and the new State Teachers College, for a trial period of 30 days. It was thought that the fares established for this special school service were possibly too high, and the Council did not wish to grant the franchise until satisfied that the rates were necessary to meet the cost of operation. Operation has been authorized under fares proposed by the Railroad Commission of California.

Los Angeles, Cal. — Pacific Electric Railway has applied to the Railroad Commission for permission to reduce service on its Beverly Boulevard motor coach line. It is proposed to operate all service on Sunday through between Castellammare and Los Angeles on one hour and 30 minute headway. The proposed change in route will result in a saving of approximately $1,450 a month. Passengers destined to or from Los Angeles on trips terminating at the Beverly Hills station may transfer to the rail service at Beverly Hills.

◆

Sacramento, Cal.—Approximately 30,000,000 passengers were transported with the loss of the lives of only three passengers, by the automotive passenger stage lines operating in California during 1930, under the jurisdiction of the Railroad Commission. Of the 380 injured persons, 200 were injured in service performed on crowded city streets, a large number of the accidents, all of them minor, being due to "sudden starts and stops" or passengers slipping while "boarding or alighting from buses."

◆

Cleveland, Ohio — Street Railway Commissioner Ballou has submitted to the transportation committee of the Council an offer by the railway to charge in its January accounts only 10 cents a mile for depreciation and maintenance instead of the 12 cents a mile it is authorized to charge. This is the second voluntary reduction of its allowance. For the last four months of 1930 it took only 7 instead of 12 cents for its maintenance fund. Mr. Ballou said the company is endeavoring to regulate its operating and maintenance funds so that the interest fund—the fare barometer—will not descend "into the red" this year.

◆

Newark, N. J. — Public Service Coordinated Transport says of its Diesel bus experiments: "Experiments with the Diesel motor now under way by Coordinated Transport engineers, hold great promise for the development of a satisfactory type of high-speed, oil-burning engine for motorcoach service. While the Diesel automotive engine is still in the experimental stage, its feasibility for ultimate adaptation to bus operation seems assured. Through these experiments with the Diesel automotive engine, Public Service has advanced the day when the advantages and economies of the oil-burning motor will be available to operators of all buses and trucks in the United States."

◆

Cleveland, Ohio—A local syndicate is offering for subscription at $100 and interest $6,000,000 of first mortgage two-year 5 per cent bonds of the Cleveland Railway. The proceeds are to be used to retire $4,745,000 of first mortgage bonds due on March 1, 1931, being the entire amount of that issue now outstanding, and to pay short-term obligations of $1,300,000, the additional cash for the purpose being supplied from the company's treasury. Upon completion of the financing the company will have no floating indebtedness.

◆

Harrisburg, Pa.—The Public Service Commission has ordered its own accountants and engineers to investigate fare schedules now in force on the Valley Railways, which some time ago raised its cash fares from 8 to 10 cents and its commutation ticket price from 8 to 9 cents. The commission initiated the inquiry.

Engineers Dissect Subway Noises

New York is going to try to quiet its subways. To this end, the city has made an appropriation for a preliminary study and the first step towards dampening the roar of its underground and overhead rail system has been taken. Entrusted with the task, the New York Board of Transportation is employing a group of sound experts to make this study. They are the acoustic engineers of Electrical Research Products, a subsidiary of the Western Electric Company, specialists in the field through their work on talking motion pictures.

The first thing the engineers did was to take a mechanical device, many times more accurate than the human ear, on a tour of the subway. One microphone "listened" outside the car and another inside. The engineers were able to report at once that nside is noisier than outside. They also found that the loudest noise is produced not when the train starts nor when it stops, but at about the moment when its acceleration is greatest, that is when it is picking up speed fastest.

Part of this device is a sound filter. It breaks up the noise, showing whether it is strongest in the high notes, or the low, or somewhere in between. This is considered important because high notes, even when not as loud as the low notes, can be more irritating to the ear.

On their first trip the engineers gathered information to plan their campaign. They now propose to study the noise of wheels passing over different types of joint, cars going around curves, brakes being applied and the effects of reverberations in the tube.

Once it is known what parts of the din and how much are caused by gears, wheels, tracks and echoes, the next step will be to determine what types of sound-absorbing and noiseless materials, what type of construction and what methods of operation will do most to hush the subway.

◆

Newspaper Would Force Electrification

The Illinois Commerce Commission has under advisement the complaint of the Chicago *Tribune* agaignst the Chicago & North Western Railway Company, et al, requiring the defendants—which include 24 railway companies—to electrify their roads within 50 miles of the Chicago terminals and requiring them to reconstruct and enlarge their stations. The complaint further states that the passenger train service performed by the said defendant—into and out of their respective passenger terminal stations in Chicago, with the sole exception of the Illinois Central Railroad's electrified suburban traffic—is "unsafe, improper, inadequate and insufficient." The *Tribune* also says that "such passenger service cannot be augmented and expedited—as will be required for aforesaid passenger traffic incident to the World's Fair of 1933, unless the terminals are modernized by reconstruction and enlargement, and electrification, with substitution of electric motive power for steam motive power."

Favors New Springfield Deal

Terms laid down by the city of Springfield, Ohio, under which it would grant a franchise for a combination street railway and gasoline bus transportation service are satisfactory to D. P. Abercrombie, Boston, representative of the bondholders of the Springfield Railway. He will recommend their acceptance to the bondholders.

Under the plan, the bondholders would form a new company, take over the Springfield Railway, and lift the receivership. The new transportation system would consist of some of the present railway lines, augmented by gasoline bus lines on certain streets. The present rate of fare would be retained under the terms of the franchise. That fare is 7 cents cash with eight tickets for 50 cents. Mr. Abercrombie promised to have the reply of the bondholders in the hands of the city within the next fourteen days so that the city could proceed at once.

◆

Twin City Opposition Fails

Despite a last minute effort by a stockholders' committee to block the present management of the Twin Cities Transit Company, Minneapolis, from re-electing the four directors whose terms expired, by advancing a claim that the proxies obtained by the management are invalid, the four directors were declared re-elected on Feb. 26 by Horace Lowry, president of the company. The directors declared elected were Mr. Lowry, E. W. Decker, president of the Northwestern National Bank of Minneapolis; Frank Bergen and A. E. Ames of A. E. Ames Company, Ltd., Toronto. Mr. Lowry said that two or three of the directors were in favor of placing one of the committee's selections on the board.

◆

Profitable Meeting of Trolley Bus Committee

Beginning its engineering and operating studies of the trolley bus, special committee No. 7 of the rolling stock division, A.E.R.A., held its first meeting in Chicago on Feb. 19, 1931. Under the chairmanship of W. C. Wheeler, equipment engineer Chicago Surface Lines, this committee sat in joint session with sub-committee No. 2 of the National Fire Protection Association. Three of the largest trolley bus systems were represented, as were practically all manufacturers of trolley buses and equipment.

Intended originally to be a one-day session, members elected to stay over and meet again on Friday morning, so great was the enthusiasm and the promise of data being developed. At the close of the meeting on Thursday afternoon, representatives of the Chicago Surface Lines were hosts to the members of the committee on an inspection trip of the Chicago trolley bus system. In addition to this, two of the latest vehicles purchased by the Surface Lines were on display in the west shops to permit members of the committee to inspect latest trolley bus construction and design. The entire formal program for this meeting was carried out and additional subjects were discussed and planned for future study.

Inducing Suggestions from Employees

Under the present plan of the United Railways & Electric Company, Baltimore, to induce helpful suggestions from employees, the work of finding, testing, valuing and rewarding good ideas conceived by workers for improving service, increasing safety, raising revenues or cutting costs, is done by three company officials as a "Committee on Suggestions."

At the start, it was an unwieldly committee composed of all the heads of departments, and it took a long time to get a suggestion discussed, tested and passed upon. With the present small and active committee a comparatively short time now elapses between the deposit of a written suggestion in a suggestion box and the dispatching of a check in payment to the suggester of a profitable idea.

Forty-two suggestion boxes are fastened securely to the walls in all United Railways offices, shops and carhouses. There is a place in each one for a poster calculated to send every employee dashing for paper and pencil to put down a smart idea.—*Baltimore Sun.*

Canadian Pacific Seeks Aroostook Valley

The Canadian Pacific Railroad has asked the Interstate Commerce Commission for permission to acquire majority stock control of the Aroostook Valley Railroad by purchase of 2,000 shares out of the 2,970 shares of the road's outstanding common stock from Arthur R. Gould, of Presque Isle, Me., on the basis of $264.87 per share.

Aroostook Valley line operates 32 miles of electric railway in northern Maine, the principal terminals of which are at West Presque Isle, Sweden, Caribou and Washburn Junction, at which points it connects with the Canadian Pacific.

Applicant stated it now owns 400 shares of Aroostook Valley stock which it acquired in 1925 at a cost of $88.11 a share, which, together with the proposed acquisition of 2,000 additional shares, will give it 2,400 shares out of the 2,970 shares of the total outstanding capital stock.

Price to be paid for the stock was determined by a committee of valuations appointed by the parties in interest.

Trustee Seeks to Sustain Abandonment

The Ohio Supreme Court is asked to dismiss the application for a reversal of the Public Utilities Commission order for abandonment of service by the Scioto Valley Railway & Power Company, in a brief filed on Jan. 30, by the law firm of Arnold, Wright, Purpus & Harlor, attorneys, for the Huntington National Bank, Columbus, trustee for the bondholders.

The interurban was authorized to abandon service, effective Oct. 1. Supporting the wisdom of the decision to discontinue service, the Huntington Bank brief asserts that the company, then operating at a loss, now is showing a profit. It also has under contract the right to buy the stock of the Valley Public Service Company, a bus company operating in the same territory at a profit, and this purchase will mean further earnings for the Scioto Valley Railway & Power Company, the brief asserts.

The Business Outlook

TELESCOPES trained on foreign affairs yield more for the optimist this week than do economic microscopes examining domestic movements. At home there is still no decisive evidence of business change. Steel activity shows no sign of marked increase in demand from big consumers and spring automobile sales prospects are still uncertain. Strengthening of raw cotton prices, increased textile demand, and a rise in residential building projects have stirred enthusiasm, but there is insufficient explanation of the rise in stock market prices and activity, perfectly paralleling last year's. Expansion of bank investments is encouraging, but as yet indecisive of any definite change in credit policy. After all, the most cheering business news of the week will be the rush order of caskets for the 71st Congress.
—*The Business Week.*

Another Motor Transport Investigation Proposed

The House Interstate Commerce Committee approved on Feb. 24 the Parker resolution to authorize the Interstate Commerce Commission to investigate all interstate transportation concerns operating in competition with railroads. The inquiry would be made into coastwise and inland waterway, motor bus, pipe line and other systems. It would be conducted with a view of determining whether any or all should be regulated. The commission would be directed to make recommendations with a view to bringing about legislation to control the competitive transportation facilities.

Ornate Emblem for East Bay Lines

New emblem of the East Bay Street Railways, Ltd., Oakland, Cal., to take the place of the old emblem of the Key System Transit Company, which formerly operated the street car system in the east San Francisco Bay region.

Freight Operation Still a Matter of Negotiation

Indications that the Cincinnati & Lake Erie Railroad intends to challenge the right of the city to bar the operation of freight trains in the city limits are contained in a letter sent on Feb. 24 to the city by counsel for the railroad. The letter also indicates that it will be up to the city to make the first move, if any in the matter. The letter was in response to one issued by the city a few weeks ago, in which the city challenged the right of the railway to operate freight trains over its tracks in Springfield and insisted that an immediate statement be made by the company showing how it planned to "eliminate the freight nuisance." In reply, the company said that it expected to continue operation of the freight trains, but hoped to work out some plan whereby the trains could be speeded up through the city. Springfield is a sort of "hub" in the company's operations so that any bar on freight train operations through the city would affect all of the company's freight operations to Columbus, Toledo, Cincinnati and way points. The city proposed informally that the company enter into an agreement with the Erie Railroad which has a semi-belt line on the outskirts of the city whereby the steam and electric lines would share use of the belt lines for the operation of the traction freight cars, but electric railway company officials said this was impractical.

Youngstown & Ohio River Sold Subject to Confirmation

Judge W. F. Lones of Lisbon will be asked to approve the sale of the Youngstown & Ohio River Railroad to Briggs & Turvias, Chicago, for $125,000 made at the seventh auction to dispose of the line. Special Master J. D. Dewees formerly general manager of the company and recently its president, was the auctioneer. The original upset price fixed by the court was $240,000. When no bids were received at any of these attempted sales, the court permitted a reduction to $100,000, a price that attracted many bidders. The new owners intend to continue operating the line, but declined to comment on reports that it would be used as a link for a new route to Cleveland, 50 miles north of Salem, the northern terminus of the line.

New Offer for Scioto Valley Stock

Holders of preferred and common stock of the Scioto Valley Railway & Power Company, Columbus, Ohio, are being offered the participating preferred shares of the American Electric Securities Corporation. This offer succeeds a proposition which Glen R. Snider and his associates were unable to consummate owing to the depressed financial situation and to litigation seeking to reverse the action of the Public Utilities Commission authorizing the abandonment of the Scioto company's transportation system. Most of the stock of the Scioto Valley company was deposited with the Huntington National Bank, Columbus, under the Snider proposition and those who take advantage of the American Electric proposition will be able to complete the transaction at once, it is stated.

Rapid Transit Talk Revived at Cincinnati

His company stands ready to cooperate, J. H. McClure, vice-president of the Cincinnati & Lake Erie Railroad, told the Federated Civic Associations of Cincinnati at their annual dinner meeting on Feb. 12, in plans to utilize the city's partially constructed rapid transit system. He said:

> The picture as we see it is that with a relatively moderate additional expenditure, it would be possible to make advantageous use of the rapid transit system thus far constructed. This would provide rapid transit service to a substantial part of Cincinnati and more expeditious transportation facilities to Hamilton, Middletown, Dayton, Springfield, Columbus, Lima, Toledo and Detroit.
>
> The city should provide the funds necessary to complete the present rapid transit line, including the viaduct or approach by which the Cincinnati & Lake Erie Railroad would enter the subway. The subway should be owned by the city; the cars by the Cincinnati Street Railway and our company.

President Draper of the Cincinnati Street Railway said that studies have indicated that passengers carried by all forms of public local transportation would not provide sufficient revenue to pay any substantial amount upon the city's investment in the new enterprise. He believes, however, that in the not very distant future, conditions will improve so that a plan of the kind may be considered.

Edgar Dow Gilman, municipal utilities director, said that he felt that the basic rate of fare on the transportation system of the city as a whole should not be jeopardized by operation of the rapid transit line.

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Proposed Philadelphia Sale Meets Obstacles

A plan for the city to buy the Philadelphia railway system for $150,000,000 appeared to be near collapse on Feb. 25, when the Philadelphia Rapid Transit Company, through its counsel, Ellis A. Ballard, rejected that figure as a basis for sale.

A committee of experts presented a report to the general transit conference estimating a fair valuation of the system and its underliers at between $140,000,000 and $1[illegible]0,000,000. This estimate fixed valuations of $80,000,000 for the underlier stocks, and $28,000,000 for the stock of the Rapid Transit Company, with the balance made up of various company bonds. This would allow $32 a share for the common stock, which is selling at about $20. Par is $50.

The State Public Service Commission previously placed a value of $149,000,000 on the underlier securities alone and the superior court estimated the Philadelphia Rapid Transit valuation at more than $200,000,000.

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Toledo on the Up-Grade

With fairly good business in the last month of 1930 due to slight gain in employment and holiday shopping the Community Traction Company, at Toledo, Ohio, completed its year with a total of 41,617,622 passengers carried, and 8,704,047 miles of service operated, as compared with 52,636,064 passengers and 9,126,883 miles of service in 1929.

Total revenue for the year was $3,067,844 as against $3,887,020 in 1929. After operating expenses and taxes, the income was $313,941 last year as against $832,078 in 1929. Depreciation, sinking fund and interest charges totaled $351,134 in 1930. After adjustments for power refund and taxes, and the setting aside of $474,393 in bond interest and dividends as provided in the Milner ordinance, the net loss to the stabilizing fund was $446,165, making the deficit in that fund $1,547,998.

More extensive bus operations are indicated in 1930 with 4,689,502 miles of railway service and 4,014,545 miles of bus service.

The operating ratio for street cars was 84.229 per cent and for buses 85.144 per cent. The high ratio for street cars is due almost entirely to the lack of peak riding caused by lessened industrial activity.

The Maumee Valley Transportation Company, an interurban subsidiary, in its first seven months of operation earned a net income of $3,946 after all charges.

What's in *News of the Industry*

Interesting review of Boston "L" situation.

$2,500,000 San Francisco program to proceed.

Talk of another Omaha bridge revived.

Enthusiastic discussion of trolley bus in Chicago.

Cataloging the subway's roar.

Present Twin City management sustained.

No decisive evidence of business change.

Toledo shows evidence of improvement.

Ohio road adopts the container idea.

Full service must be restored in Columbia.

Twenty-five year development plan for London.

Hitch in Philadelphia sale.

Canadian Pacific after Maine electric.

◆

Pirate Taxi Hurts Norman Buses

An ordinance has been adopted by the City Council of Norman, Okla., intended to protect the McIntire Transportation Company from competition of 10-cent taxicabs along its regular bus routes in Norman. The ordinance provides that the chief of police determine the number of taxi stands necessary on fixed jitney routes and that it will be unlawful for a taxi to park anywhere else on the routes unless in response to a call for taxicab service. The chief object of the ordinance is to prevent taxis from covering the regular routes ahead of the buses and so solicit the passengers who are waiting for transportation. The McIntire Transportation Company has operated buses over regular routes in Norman for several years.

Conspectus of Indexes for March, 1931

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Feb., 1931 **7.77**	Jan., 1931 **7.77**	Feb., 1930 **7.69**	Oct., 1930 **7.79**	Feb., 1926 **7.35**
Electric Railway Materials* 1913 = 100	Feb., 1931 **125**	Jan., 1931 **126**	Feb, 1930 **143**	Dec., 1926 **159**	Feb., 1931 **125**
Electric Railway Wages* 1913 = 100	Feb., 1931 **231.9**	Jan., 1931 **231.9**	Feb., 1930 **231.7**	Jan., 1931 **231.9**	Feb., 1926 **223.8**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Feb., 1931 **190**	Jan., 1931 **189**	Feb., 1930 **204**	Nov., 1928 **206**	Jan., 1931 **189**
General Construction Cost Eng'g News-Record 1913 = 100	Feb., 1931 **196.6**	Jan., 1931 **194.5**	Feb., 1930 **206.5**	Jan., 1927 **211.5**	Jan., 1931 **194.5**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Jan., 1931 **77.0**	Dec., 1930 **78.4**	Jan., 1930 **93.4**	Jan., 1926 **103.6**	Jan., 1931 **77.0**
Wholesale Commodities Bradstreet 1913 = 9.21	Feb., 1931 **9.31**	Jan., 1931 **9.51**	Feb., 1930 **11.51**	Feb., 1926 **13.72**	Feb., 1931 **9.31**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Jan., 1931 **132.8**	Dec., 1930 **137.2**	Jan., 1930 **155.4**	Jan., 1926 **164.3**	Jan., 1931 **132.8**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Dec., 1930 **147.6**	Nov., 1930 **150.0**	Dec., 1929 **162.0**	Dec., 1925 **171.4**	Dec., 1930 **147.6**
General Business The Business Week Normal = 100	Feb. 7, 1931 **76.8**	Jan. 10, 1931 **80.3**	Feb. 8, 1930 **92.8**	Oct. 6, 1928 **117.6**	Feb. 7, 1931 **76.8**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Jan., 1931 **100.1**	Dec., 1930 **99.1**	Jan., 1930 **121.8**	Feb., 1929 **140.4**	Dec., 1930 **99.1**
Bank Clearings Outside N. Y. City 1926 = 100	Jan., 1931 2495 **74.5**	Dec., 1930 2000 **81.1**	Jan., 1930 1827 **95.2**	Oct., 1929 2495 **111.8**	Jan., 1931 1348 **74.5**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

FOREIGN NEWS

Traffic Board for Metropolitan London Now in Prospect

Some weeks ago the British Government published the official notice that in the present session of Parliament it would promote the long promised London Passenger Transport Bill. It is to be a comprehensive and sweeping measure, providing for the establishment of a Transport Board for Metropolitan London. To this board all the underground railways and all the tramway and bus undertakings would be transferred. The board would manage, maintain, carry on, co-ordinate, and develop the existing undertakings. There would be a tribunal for settling disputes. On the financial side, the board would be empowered to issue stock in payment for the undertakings taken over, and there was a hint of a State guarantee of interest. The suburban traffic of the main line railways had not been brought within the scope of the scheme, but provision was made for co-ordinating the undertakings of the board and those of the surburban lines. The bill would give the board the right to prohibit or restrict the running of any public service vehicle if on any one journey any passenger is both taken up and set down within the London traffic area. Thus the board's monopoly would be maintained.

PLAN LONG A SUBJECT OF AGITATION

The bill is promoted by the government, but it is essentially a private bill, subject to private bill procedure. That is to say, it will have to go before a select committee. Such hearing may be of some length, as many parties are concerned. The Parliamentary notice of the bill, like the notices of many private bills, is wide and general in its terms. For more than a generation official commissions and committees inquired into the subject, but nothing tangible was done. The Minister of Transport has intimated that the board shall be free to devote itself solely to practical matters for the good of London passenger transport.

Using a River Bed for Street Railways

At a recent meeting of the Belgian Conseil Superieur des Transports, the question of dealing with the growing congestion of traffic in Brussels was considered. While it was agreed that electric railways are still the most economic method of surface transport, it was felt that something must be done to relieve congestion. After full consideration, however, the proposal to construct an underground electric railway was rejected on the ground that the cost of the line would be greater than the traffic returns would justify.

Instead, the Council resolved to push a scheme to utilize the bed of the river Senne, which runs underground through Brussels, for the street railway running between the Nord and the Midi railway stations. Since the course of the river is now being diverted (a work expected to be completed in 1934) that will leave the old river bed dry. The two railway stations are at opposite ends of a long, straight boulevard, and to remove the railway lines from the boulevard, short inclined tunnels would have to be constructed to link up with the river bed which lies practically below the boulevard. The cost is estimated at about $3,250,000, with an additional $2,500,000 to provide modern rolling stock.

London Underground Headquarters Best Building

The presentation of the London Architecture medal and diploma for 1929 was made recently by Sir Banister Fletcher, the president of the Royal Institute of British Architects, to Adams, Holden & Pearson, for their work on the London Underground Railway headquarters at Westminster. The architects were successful in producing a structure of pleasing proportions, crowned by its great central tower. Charles Holden, one of the architects, in accepting the medal and diploma, declared architecture to be the one historian whose veracity was unfailing. It tells of the weaknesses and indifferences of an age, as well as of its aspirations. Frank Pick, managing director of the railway, said that the building was a plain expression of its structure. There has been no attempt to ornament or disguise it. He pointed out that, because of the city restrictions, the occupiers were not permitted to use the floors higher than the eighth story.

Spare the Uniform

The crown has surely been set on bureaucratic self-sufficiency in Hungary by the management of the Budapest Street Car Company, which has issued an order prohibiting its employees from committing suicide while wearing the company's uniform. Early in November a conductor named Dora shot and killed himself on coming off duty while still in uniform. A few days after the funeral the manager harangued all conductors at length on the culpability of any man wearing the company's uniform at the moment of putting an end to his life. He pointed out that where suicides were so inconsiderate of their employer's interests as to shoot themselves in uniform, the company's property was apt to become damaged or stained to such an extent that it could not be reissued. If the rule against suicide in uniform was broken again the company would recover the cost of the uniform from the dead man's relatives.

1,500-Volt Direct Current for Use in England

Successful trial runs have been made on the Manchester-Altrincham Railway (England) with a multiple-unit train using direct-current at a pressure of 1,500 volts. This is to be the first line working regularly with such high voltage, though in the past there have been one or two experiments with still higher pressures. A few years ago a Government-appointed committee recommended 1,500 volts for future railway electrifications, but the standard on British electric railways has remained 600 volts.

Regenerative Control

The Council of the British Municipal Tramways and Transport Association has appointed a committee to consider the question of investigation and experiments in the matter of regenerative control for tram cars. This is the outcome of a visit by a delegation of tramway managers and engineers to a meeting of the International Tramways Union in Paris in October, when an elaborate engineering paper on regenerative control was submitted and discussed. Regenerative control was tried on a steep hill tramway in London many years ago, but was never largely adopted.

London's Twenty-Five Year Traffic Plan

According to Herbert Morrison, Minister of Transport, great thoroughfares will eventually cut across London's present haphazard cluster of streets; there will be elevated crossings at important junctions, all railroads into the city will be electrified and airdromes will grace the roofs of terminals. This, Mr. Morrison points out, is more or less a vision of what must happen in the future. Mr. Morrison already is responsible for the motor code, the first of its kind known in England. He has begun work on various important arterial roads and other developments, including solving traffic troubles at complicated street junctures. He said recently:

> We must reduce congestion on our roads and streets not only in London but all over the country. It's worse in London, which has grown too large. The public twenty-five years hence will wonder how we tolerated the conditions of 1931. By 1950 all public services will be co-ordinated and there will be a kind of national Bradshaw time-table setting out the train and motor coach service of the country. Only the most luxurious and highest class of motor coach will be permitted on the roads. Only the finest drivers will be allowed on these services.

London, Mr. Morrison said, has studied traffic conditions and regulations in New York and Chicago. There are already two bodies interested in planning London for the future, although these are no official bodies, and there has as yet been no concentration on a single "25-year plan" such as the Transport Minister seems to be proposing.

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Berlin, Germany — The board of the German State Railway Exploitation Company has decided, in support of the Government's measures for alleviating unemployment, to accept a long-term credit of about $12,500,000 from electrical manufacturers, the credit to be used for railroad electrification schemes in South Germany. It is understood that the Reich Government will guarantee the interest on the loan until this is covered by economies arising from the electrification.

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Tokio, Japan — To meet increased competition Tokio's municipal railway officials are reported planning a system of trolley buses. Shanghai is the only city in the Far East in which the trolley bus is now used.

PERSONAL MENTION

Changes in Louisville Railway Personnel

Frank H. Miller Succeeds J. P. Barnes as President Under Plan Outlined Previously. Roster of Other New Officers Announced. Smaller Board to Function.

At meetings of stockholders, Feb. 18, and directors, Feb. 19, the Louisville Railway has completed reorganization of its personnel with Frank H. Miller as president, succeeding James P. Barnes. Mr. Miller has been vice-president and general manager a number of years and served ten years with Mr. Barnes and many years under the previous administration of Mr. Minary. The board has been cut to thirteen men. Some months ago the executive committee was disbanded. At the time Mr. Barnes tendered his resignation, effective Feb. 18, Edward F. Kelley, purchasing agent; Frank E. Belleville, auditor and secretary, and Mrs. A. L. Humphrey, treasurer, also resigned.

F. H. Wyatt, vice-president and general manager of the Louisville & Interurban Railroad, a subsiduary, has been made vice-president and treasurer of the Lousville Railway, and will continue his Interurban connection as well. Mr. Wyatt has been with the company many years.

Russell C. Mayhall has been named secretary and assistant treasurer. Mr. Mayhall has been with the company for 21 years, as assistant to Mr. Miller, chiefly in the power, engineering and maintenance departments.

A. J. Brewer, a former newspaper man, who joined the company six years ago, a statistician, has been named auditor.

Charles W. Milner has been re-elected general counsel, a post he has held for some years. He is a member of the law firm of Humphrey, Crawford & Middleton, which has served the company for many years, first through Judge Alex P. Humphrey and later his son Churchill Humphrey, who resigned some years ago and was succeeded by Mr. Milner.

H. W. Wischemeyer, superintendent of motive power, has been named purchasing agent and research engineer. He has been with the company 2 years.

G. B. Powell, superintendent of transportation; Neill W. Funk, safety director; T. H. Minary, superintendent of way and equipment; and C. O. Seaton, superintendent of distribution, have been reappointed. F. C. DeVoe has been named superintendent of construction, and John Zall master mechanic.

Mr. Powell started with the company in 1905, Mr. Minary started with it about 1900, Mr. Funk about 1907, and Mr. Seaton about 1902. Thus the entire new organization is at present composed of company-training men.

In the reorganization the salary budget is curtailed, as other than in the case of F. H. Wyatt, who received a nominal increase in salary, there will be no increased salaries in connection with advancement of officers.

Allen R. Carter, director, in a statement at the meeting on Feb. 18, expressed the opinion that company policy should be fixed largely by committees, the officers to accept full responsibility for carrying out such plans as are devised. Mr. Carter objected to paying any more dividends until floating debt has been paid.

Mr. Barnes said that under his ten-year period of management the company earned more than in any similar period of its history. An annual depreciation charge of $175,000 had been set aside each year under his régime, an item not charged prior to that time. Mr. Barnes said that "the company is practically out of its difficulties." He contended that in 1930, one of the most trying years in the history of the company, earnings on common stock were $2.11 per share, and he predicted that with return of normal conditions the company stood to become one of the most prosperous railways in the country.

Mr. Miller, the new president, made a statement to the press in which he said that a street railway has three different groups to serve—the customer, the security holder and the employee—all vitally interested in its success. The car rider wishes good service, the creditor a return on his investment, and the employee fair treatment with a fair wage. The public also is interested since a good transportation system is an asset to the community. He said the officers of the company would continue to study carefully every proposition looking towards improvement in service in the light of transportation experience in Louisville and other cities. He made a plea for the sympathetic support of the public in the operation of the railway, saying the new management did not expect to avoid all mistakes, but that such mistakes as it might make would be mistakes of omission and would be corrected when discovered.

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George R. Green Heads Central Railway Body

George R. Green

George R. Green, elected president of the Central Electric Railway Association at the meeting in Indianapolis on Jan. 29 and 30, is vice-president and general manager of the Northern Indiana Railway, operated under Insull auspices. This is a particularly fortunate choice just at this time since Mr. Green has had unusually wide experience with all phases of operation and has a sympathetic understanding of the problems of all types of carriers that go to make up the association. Not only that, but his reputation for accomplishing things augurs well for the future of the association, made up of members beset by difficulties of operation and economic conditions unusually adverse. Under his mentorship and the mentorship of his associates in the sectional body, a continuation is to be expected of the spirit that characterized the Indianapolis meeting and of the acceptance of the broad approach to all subjects, controversial and purely technical which may arise.

Incidentally, this is not Mr. Green's first executive post in association work. Always interested in work of this kind, he served as president of the Central Electric Railway Master Mechanics' Association in 1927. He knows railway and bus problems from the equipment as well as the management angles. Thirty years ago Mr. Green started to work at the age of fourteen as an armature winder's helper with the Detroit United Railway. He was not content merely to assist in winding armatures and then to wind them himself. He studied the why's and the wherefore's. It did not militate one iota against his upward progress that he remained with the Detroit United property for eighteen years, except for three years between 1909 and 1912, during which time he was master mechanic of the Saginaw & Flint Railway.

At first, promotions came slowly and advancement was by small steps, but initiative, persistence and hard work, combined with an interest in the problems of his company outside of his immediate duties, won for him deserved recognition. He finally rose to the position of general foreman of interurban equipment with the Detroit United Railway, but when he did attain that position, few other men in the country were better qualified by experience and training than was he.

In July, 1920, Mr. Green went to South Bend as superintendent of equipment. So thoroughly impressed was the management with the man's ability that when it appeared that railway service might be supplemented with buses he was selected to study bus operation in other cities. When the new service was decided upon, he was placed in charge of starting the buses and operating them. Next followed his appointment to be general superintendent of rail lines and buses. In March, 1925, he was made general superintendent of the Chicago, South Bend & Northern Indiana Railway and its affiliated lines, and subsequently was made vice-president and general manager of the Northern Indiana Railway, under the new grouping of the Insull properties.

A. D. McWhorter Is Honored Again by Southern Group

Election of A. D. McWhorter, general superintendent Memphis Street Railway, to the presidency of the Electric Railway Association of Equipment Men, Southern Properties, at the January meeting in Chattanooga, further recognizes and honors one of the moving spirits of this organization. Associated with the group since its formation in Memphis in April, 1922, Mr. McWhorter has contributed materially to its unusual success. He was president of the association for several years after its founding, relinquishing this post in January, 1927. During that period and the years following he gave unstintingly of his energy in setting forth major objectives and seeing them accomplished.

Eight Southern companies were included in the charter membership of the association and representatives from these properties made up the attendance at the early meetings. Today there are 29 member companies, and attendance at the semi-annual meetings approaches the 200 mark. One of the first accomplishments of the association was the adoption of standard rules for determining pull-ins and preparation of a list of items for analyzing failures chargeable to the mechanical department and those not chargeable to the carhouse. This standard classification has allowed direct comparisons of pull-in records among the member companies and has led to the establishing of remarkable records on many of the systems. Comparative statements of maintenance costs also have resulted in a steady decrease for mechanical department costs. Well arranged programs and advance distribution of questionnaires with problems submitted by the members have resulted in a steady improvement of methods. In all of this work of the group Mr. McWhorter has been intimately associated.

A. D. McWhorter

On frequent occasions Mr. McWhorter has presented papers before the Southern equipment group. He also has addressed the American Electric Railway Engineering Association, the Central Master Mechanics Association and other organizations. He is on the standing committee on rolling stock of the A.E.R.E.A., is chairman of rolling stock committee No. 8, on air-operated car equipment of this association, and is a member of the T & T committee on equipment.

Mr. McWhorter entered electric railway work in Atlanta in 1894 as a conductor with the Atlanta Traction Company. Six months later he transferred to the mechanical department where his first job was in maintenance and inspection work as a member of the night force. He served there for two years and was then made night foreman. Following the consolidation of the Atlanta Traction Company and the Atlanta Consolidated Street Railway, Mr. McWhorter was appointed general foreman of the Glenn Street shops. After a year in this capacity he was transferred to the Fulton County shops, the main shop, and placed in charge of the motor and truck departments. Two years later he was made assistant master mechanic with direct supervision over all carhouses. He served in this capacity for three years, and in 1905 resigned to accept the position of master mechanic of the Memphis Street Railway. On Jan. 1, 1916, he was appointed superintendent of equipment and overhead lines of the Memphis Company. He continued in this position until April 21, 1923, when he was made general superintendent in charge of transportation, mechanical and overhead line departments.

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Samuel Anderson Leaves New London Lines

Samuel Anderson, manager of the New London Division of the Connecticut Company, has resigned because of ill health. Mr. Anderson has served at New London since 1908. He went to the post there from the Connecticut Company's line between Central Village and the Massachusetts line. Some time after he joined the system at New London the lines there and in Norwich were leased to the Shore Line Electric Railway, with which Mr. Anderson served in addition to other offices as assistant to the president. In 1920 the lines reverted to the Connecticut Company under court order, with Mr. Anderson remaining at New London in charge as local manager.

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F. D. Carpenter Heads Western Ohio

F. D. Carpenter, Lima, Ohio, has been elected to the office of president of the Western Ohio Railway & Power Corporation, succeeding J. P. Harris, Cleveland banker.

In addition to having built the entire road, Mr. Carpenter was its active head for nearly 30 years. He was relieved of its active management in 1929, when the present owners, the Empire Public Service Corporation, Philadelphia, purchased the road and selected Arch Robison for the position of vice-president and general manager. However, Mr. Carpenter was continued as a vice-president. Now, in recognition of his many years' experience in the interurban railway field, and his long and valuable service with the Western Ohio, he has been chosen president of the road. Mr. Carpenter is also president of the F. & F. Railway.

The Western Ohio Railway is an important link in the so-called "Lima Route" chain. It operates with its connecting roads fast through freight service between Dayton, Cleveland, Toledo, Detroit, and intermediate points, as well as points beyond. It also operates through passenger service from Dayton to Fremont, connecting at that point with trains of the Lake Shore Electric Railway for Toledo and Cleveland.

A. H. Gray Named by Penn-Ohio to Run Coaches

A. H. Gray, recently appointed general superintendent of the Penn-Ohio Coach Lines Company with headquarters in Akron, Ohio, is in consequence of that appointment, in charge of the largest fleet of intrastate coaches operated by any company in Ohio. The Penn-Ohio Coach Lines Company includes the coach lines heretofore operated by the Penn-Ohio System, together with what has been known as the Cleveland - Akron - Canton Bus Company.

Under the present schedule, 57 coaches are in daily operation, covering 700 miles of certified routings over the principal highways of the state and into Pennsylvania and require a total of 76 full-time operators. The system supplies coach transportation to more than 100 cities and villages, and the service is carefully regulated by eight supervisors, located at the principal terminals in Akron, Canton, Youngstown and Cleveland.

A. H. Gray

Mr. Gray assumed his new position after years of experience in the transportation field, in which he worked his way from a position as motorman to general superintendent. He entered the service of the Houston Electric Railway at Houston, Tex., as motorman in 1905, remaining there until 1920, at which time he entered the service of the West End Traction Company, Warren, Ohio, as an inspector. He served in that capacity for six years when he was appointed superintendent of the P-O. Coach Lines at Youngstown.

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L. R. Farrington Twin City Passenger Agent

Announcement was made on Feb. 20 by Vice-President T. Julian McGill of the appointment of Leslie B. Farrington as general passenger agent of the Twin City Rapid Transit Company, Minneapolis, Minn. He succeeds V. O. Law, who resigned several months ago to engage in business on the Pacific Coast. Formerly Mr. Farrington was St. Paul representative of Barron Collier, Inc. He is director of the United States Junior Chamber of Commerce and formerly was president of the St. Paul Junior Association of Commerce.

Further Recognition for J. A. Longley Tennessee Official

J. A. Longley, who, with J. P. W. Brown, was recently elected a vice-president of the Tennessee Electric Power Company, has served as assistant to the general manager for more than two years and will continue in this capacity.

Mr. Longley has been associated with the power company and its predecessors for the past seventeen years. He began his business career in the steam heating field, after leaving Massachusetts Institute of Technology at Boston, later engaging in mining engineering work in Arizona. He entered the electrical industry at Portland, Ore., in 1910. He went to Columbus, Ohio, in 1913 just after the Dayton flood, to work on the relocation and construction of a steam power plant in that city.

In the fall of that year he moved to Nashville, Tenn., to engage on construction work at the Nashville steam plant of the Nashville Railway & Light Company, transferring to Chattanooga in 1914 as assistant superintendent of the Tennessee Power Company. He advanced to general superintendent and, on the formation of the Tennessee Electric Power Company in 1922, became manager of its production and transmission department in charge of all power plants, substations and transmission lines as well as having supervision over matters of an engineering nature. In May, 1928, he was appointed assistant to the general manager. The career of Mr. Longley's associate, Mr. Brown, was reviewed in Electric Railway Journal for March.

J. A. Longley

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R. L. Wilson Leaves Westinghouse

Robert Lee Wilson has resigned as assistant to the president of the Westinghouse Electric & Manufacturing Company to devote himself mainly to his private affairs but will serve the Westinghouse Company on call as consultant.

Mr. Wilson was one of the first of industrial leaders to advocate elective representation in works councils and the amicable adjustment of disputes by joint conference committees representing management and employees. Recognition of his fairness and his service in employment and welfare work has come from all divisions of the Westinghouse organization. He has served as a member of the board of directors of the Veteran Employees' Association, and has also been very active in other shop organizations.

Step by step Mr. Wilson rose from apprentice to draftsman, to inspector, road engineer, district engineer, superintendent of construction, superintendent of railway construction, assistant general superintendent, works manager, and finally became assistant to the president, his progress during the 37 years of his connection with Westinghouse being constantly and steadily forward.

While he was district engineer, with headquarters in New York, from 1903 to 1905, Mr. Wilson superintended the original electrification of the Manhattan Elevated and the New York subway. While he was superintendent of railway construction from 1906 to 1909, he handled the construction and installation of equipment for the electrification of the New Haven Railroad and the St. Clair tunnel of the Grand Trunk Railroad—the first two important alternating-current railroad electrification projects in the United States.

Mr. Wilson was born in Shelbyville, Ill., on Jan. 29, 1871. He attended the University of Iowa for one year, but was graduated from Rose Polytechnic Institute, Terre Haute, Ind., with the degree of Bachelor of Science in mechanical engineering in 1892. After a year of post graduate work in electrical engineering at Johns Hopkins, he went to work for Westinghouse in 1894.

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Messrs. Wheeler and Jones on Colorado Commission

Edward E. Wheeler and Dan S. Jones were appointed members of the Colorado Public Utilities Commission by Governor Adams on Feb. 16. Both appointees are former state senators, Mr. Wheeler from Ouray, Col., and Mr. Jones from Center, Col. Their appointments were immediately confirmed by the Senate. Mr. Jones is a member of the present utilities board. He will remain in office four years more. The designation of Mr. Wheeler for a six-year term automatically removes Chairman Otto Bock, who has been serving as a hold-over, his intended successor having failed of confirmation after gubernatorial appointment two years ago.

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Member of Toledo Board Resigns

David H. Goodwillie, a member of the street railway board of control at Toledo, Ohio, for ten years, has resigned due to the pressure of his private business. He was a former director of public service of Toledo, was a member of the valuation commission which functioned previous to the adoption of the Milner service-at-cost ordinance under which the Community Traction Company operates, and was appointed on the first board of control. He has served as chairman of the board three different terms. Mr. Goodwillie is now vice-president in charge of engineering and production of the Libbey-Owens-Ford Glass Company. His successor as a member of the railway board has not yet been named by Mayor Jackson. Other members of the board are Henry C. Truesdall and George L. McKesson.

Toledo has taken Mr. Goodwillie's withdrawal not without regret, but has acknowledged its debt to the man for his long, public spirited participation in so important a civic undertaking.

G. H. Blakeley to Head McClintic-Marshall

G. H. Blakeley will become president of the McClintic-Marshall Corporation, as announced in conjunction with the agreement to acquire that company by the Bethlehem Steel Corporation. For many years he has been a prominent figure in the field of structural engineering, and has had an active part in many of the developments which have fostered modern skyscraper and bridge construction.

His appointment as vice-president of Bethlehem Steel Company in 1927, having entire charge of the structural steel operations of the company, was the result of his activities with Bethlehem and the development of Bethlehem structural shapes since his affiliation with the company in 1906. He was manager of the structural steel department from 1908 to 1927, and president of Bethlehem Steel Bridge Corporation from 1916 to 1923, when it was amalgamated with the divisions of the company which he has had to the present time.

G. H. Blakeley

In 1906 Mr. Blakeley was invited by Charles M. Schwab to join Bethlehem to work in collaboration with the late Henry Grey to develop Grey's process mills. A study of the possibilities of this process and the sections which it could handle for structural purposes resulted in developing the broad flange Bethlehem beam, which has been a large factor in many modern construction undertakings.

Mr. Blakeley was born on April 19, 1865, at Hanover, N. J. He was graduated at the age of nineteen from Rutgers College in the class of 1884 with the degree of bachelor of science. He also holds the degree of civil engineer awarded in 1894, and doctor of science in 1924. He is a life trustee of Rutgers University.

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R. E. Jamieson Passenger Agent of South Shore

R. E. Jamieson has been made general passenger agent of the Chicago, South Shore & South Bend Railroad. Mr. Jamieson, whose headquarters are in Chicago, joined the South Shore at South Bend on April 1, 1926, as district passenger agent. He has held that position since, but was transferred to Chicago in 1927. Before coming to the South Shore Line Mr.

Jamieson was traveling passenger agent for the Canadian Pacific Railroad, working out of Chicago. He had been in the employ of that road in various capacities for sixteen years. He is active in traffic club work.

Lamme Medal Awarded to W. J. Foster

The Lamme Medal of the American Institute of Electrical Engineers has been awarded to Dr. William J. Foster, Schenectady, N. Y., "for his contributions to the design of rotating alternating-current machinery." Presentation will be made at the Summer Convention of the Institute which is to be held in Asheville, N. C., June 22-26, 1931. The Lamme Medal was founded as a result of a bequest of the late Benjamin G. Lamme, chief engineer of the Westinghouse Company, who died on July 8, 1924, to provide for the award by the Institute of a gold medal (together with a bronze replica thereof) annually to a member of the American Institute of Electrical Engineers "who has shown meritorious achievement in the development of electrical apparatus or machinery" and for the award of two such medals in some years if the accumulation from the funds warrants. A committee composed of nine members of the Institute awards the medal.

New G. E. Vice-Presidents

Charles E. Wilson, of Bridgeport, and T. K. Quinn, Cleveland, have been elected vice-presidents of the General Electric Company; H. H. Barnes, New York, has been elected a commercial vice-president in charge of the New York district, and J. L. Buchanan, of Bridgeport, has been elected president of the General Electric Supply Corporation.

Charles E. Patterson, Bridgeport, and Cummings C. Chesney, Schenectady, retired on Jan. 1 as vice-presidents. Mr. Patterson is also retiring as president of the G. E. Supply Corporation, but will continue to serve as a director of the various associated companies having to do with the sale of merchandise and supplies. Mr. Chesney has been elected an honorary vice-president.

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James Lightbody, publicity director of the British Columbia Electric Railway, Vancouver, B. C., has been appointed chairman of the advertising and sales bureau of the Vancouver Board of Trade. Mr. Lightbody is well known in electric power and transportation circles. He has long been publicity manager of the British Columbia Company.

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W. D. Kyser, president of the Memphis Power & Light and the Memphis Street Railway, Memphis, Tenn., will represent Memphis when next the national council of the Chamber of Commerce of the United States meets in Washington, by virtue of his appointment as national councilor of the Memphis Chamber of Commerce. Mr. Keyser's appointment also makes him chairman of the chamber's national affairs committee, which usually casts the chamber's vote on national referendums.

◆

L. E. Shippey has been installed in Seattle by the Pacific-Greyhound Lines as district passenger agent. His territory extends from Vancouver, B. C., to Portland, and he will personally contact all ticket agencies in promotion of long-haul traffic. Mr. Shippey's introduction into stage transportation was through the old Coast Auto Lines when he became their agent at Crescent City, Cal., in 1927. From there he was transferred to the joint agency of the Coast Auto Lines and the Oregon Stages at Grants Pass, Ore. In January, 1930, he was sent to Portland, to become assistant to Mr. Hadfield, superintendent of transportation of the Pacific-Greyhound Lines out of Portland, and he became closely acquainted with the operating end of the stage business. As district agent at Seattle he will co-operate closely with officials of the North Coast Transportation Company, affiliated with the Puget Sound Power & Light Company.

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Merle Aldrich, who relinquished the post of electrical engineer of the Chicago, South Shore & South Bend Railroad, South Bend, Ind., more than a year ago to become engineering assistant to the master mechanic, has once more resumed the office of electrical engineer. Before he came to the South Shore Line in January, Merle Aldrich was with the Chicago Rapid Transit Company for three years, having gone with that company shortly after he was graduated from Purdue University with a degree in electrical engineering.

Everett W. Sweezy has resigned as president and general manager of Utilities Service Company, Suburban Light & Power Company and Suburban Power Company, operating in a score of Ohio cities. It is also understood that he has withdrawn as vice-president of the Stack Electric Railroad, Alliance, Ohio. Mr. Sweezy has gone to Los Angeles to do research work in design of ice plants.

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W. S. Linn, formerly connected with the Fairmont offices of the Monongahela West Penn Public Service Company, has been appointed auditor of the Parkersburg-Marietta division. W. R. Doughty, auditor at Parkersburg for several years for the Monongahela system, has been transferred to Fairmont, the main offices of the company in West Virginia, out of which he will work as traveling auditor.

◆

Charles A. Wittcke, for many years identified with the purchasing department of the Fifth Avenue Coach Company, New York, has been appointed purchasing agent to succeed Worthington G. Strait, who had held the office for four years. Mr. Wittcke has been with the company since 1908, when he entered the employ of the New York Transportation Company as a clerk in the auditor's office.

OBITUARY

Dr. Ing. Colomon de Kandó

Dr. Ing. Colomon de Kandó, known the world over especially for his work as an engineer in the field of heavy electric traction, died suddenly in Budapest on Jan. 13. Wide recognition had come to Dr. Kandó in scientific circles. In acknowledgement of his merits, the Hungarian Academy of Sciences bestowed upon him in 1921 the Wahrmann prize. In 1922 he had been promoted at the Technical University of Budapest to doctor honoris causa. In 1923 followed his nomination to councillor superior of the Hungarian government, in 1927 his election to corresponding member of the Hungarian Academy of Sciences. On the occasion of the constitution of the Upper House of the Hungarian Parliament, the Chamber of Engineers delegated him into it as their representative. Still more recently, namely in October, 1930, he was entrusted by the Royal Hungarian Minister of Commerce to elaborate, in common with Messrs. M. de Hoor-Tempis and L. de Verebély, the general electrification scheme of Hungary.

Colomon de Kandó was born in Budapest July 10, 1869. After finishing his studies at the Technical University of Budapest he began his practical work with the Compagnie de Fives-Lille in Paris, then one of the most important manufacturers of electric apparatus and of locomotives. In 1894 he entered the services of Ganz & Company, for which he developed three-phase high-tension current for main line electrification applying the system to the Valtellina line—an epoch-making installation. In 1905, de Kandó left Ganz & Company to go to Italy and establish at Vado, by wish of the late George Westinghouse, the Italian Westinghouse Works.

When Italy entered the World War, de Kandó returned to Hungary, entered military service and was attached to the central management of transports. Soon thereafter he was exempted from military service, returned to Budapest and reentered the services of Ganz & Company as a technical manager. In 1919 he was appointed to the office of general manager of this firm.

It was at this time that he worked on the "split phase" system for main line electrification. He also projected the "Kandó triangle," which has been successfully applied in electric locomotives. Since 1923, de Kandó had devoted all his theoretical and practical work to development, the new system giving such promise on the trial Budapest-Alag runs that the electrification of the Budapest-Hegyeshalom line to be started in the near future will be carried out on this system.

At the same time he designed for Ing. Nic. Romeo, Milan, now the firm "Cemsa," three-phase and split phase locomotives and improved his "triangle," applying it successfully on the Paris-Orléans locomotives. In 1927 he spent several months as a technical adviser at Pittsburgh with the Westinghouse Company.

Edward Gagel

Edward Gagel, chief engineer of the New York, New Haven & Hartford Railroad for 24 years until his retirement in 1929, died on Feb. 12 at his home in West Haven, Conn. Mr. Gagel was 73 years old. He joined the New Haven as a draftsman in 1882, and was made an assistant engineer in 1885.

In 1891 he was appointed district engineer, and in 1900 was given the title of assistant engineer. He became principal assistant engineer in 1904 and in 1905 was made chief engineer of the road. He was connected with most of the large construction projects along the main line of the road, and supervised the construction of many of the trolley lines now included in the system of the Connecticut Company and carhouses and other structures for that system, an affiliate of the railroad.

Sir Charles Parsons

Sir Charles Parsons, internationally known engineer and inventor of the modern turbine, died on Feb. 11, in his 77th year, while on a cruise to the West Indies. The application of steam turbines to general use did not become possible until 1884, when Sir Charles disclosed his master invention, which revolutionized marine travel. From his early youth Sir Charles exhibited a talent for science and was encouraged in this inclination by his father, the Earl of Rosse, who was president of the Royal Society and the designer of many improvements in the telescope that bears his name.

Scott F. Hazelrigg

Scott F. Hazelrigg, formerly president and general manager of the Atlantic Coast Electric Railway, Asbury Park, N. J., died at his home in Wawassee, N. J., recently, after a prolonged illness. He was 68 years old.

Mr. Hazelrigg was born in Greensburg, Ind., but worked on a railroad in Texas as a youth. Subsequently, he went to Indianapolis and started with the local street railway as a horse car driver. He became general manager of the company in 1887 under President Tom L. Johnson, later Mayor of the city of Cleveland. He went to Cleveland in 1890 with Mr. Johnson and later moved to New York City. Mr. Hazelrigg helped to organize the railway system in Kansas City, Mo. He is credited with building the first electric railway in Brazil. He made many investments in other South American industries.

G. H. Burgess

George H. Burgess, superintendent of Division No. 3 of the Worcester Consolidated Street Railway, Worcester, Mass., over a period of 30 years or more, and most recently superintendent of the Fitchburg and Leominster District of the New England Transportation Company, died on Jan. 5 at the Leominster Hospital following a short illness.

Mr. Burgess was born in Plymouth, Mass., 65 years ago. He joined the Worcester railway as a young man. His executive ability and excellent judgment led to his appointment as superintendent of Division No. 3. In recent years he had been connected with the New England Transportation Company, a subsidiary of the New Haven Railroad.

H. L. Mack

Hubert L. Mack, former vice-president in charge of construction for the International Railway, Buffalo, N. Y., is dead. He was 65 years old. Mr. Mack had been in ill health for several years. He made his home on a farm at Alden, N. Y. Going to Buffalo 34 years ago as a lineman for the railway, Mr. Mack advanced rapidly until he became vice-president. He served in this capacity for five years before resigning some years ago to organize his own construction company.

◆

Edgar Cone, 71, the oldest active employee of the Omaha & Council Bluffs Street Railway, died on Jan. 27, in Omaha. He had worked for the company for 50 years. Mr. Cone entered the service in 1881 when the company operated only six horse cars. For a time he acted as assistant superintendent. For the past 30 years he worked in one of the carhouses. He remained on duty until a week before his death. W. H. Smith, former general manager of the company, now retired, is the only surviving official of the days when Mr. Cone began working for the company.

◆

Robert C. Rogers, former editor of the St. Louis Public Service Company's employees' magazine, *The Public Servicer,* died recently in Louisville, Ky. He had been ill for two years. He was 47 years old.

◆

James Donahue, chief motorman of the Connecticut Company, New Haven, Conn., for the past twenty years, died on Dec. 31 at his home in Mount Carmel, Hamden, Conn. Mr. Donahue was 50 years old. He started with the Connecticut Company as a motorman in 1900. He was made a starter in 1902 and was appointed chief motorman on June 21, 1910.

◆

Charles Henry Markham, chairman of the board of the Illinois Central Railroad, who died recently at Altadena, Cal., was a leader in the advocacy of the electrification of the Illinois Central's suburban service in Chicago. Mr. Markham began his railroad work as a section hand for the Sante Fe. He rose through many positions of responsibility until, in 1911, he was named president of the Illinois Central. Electrification work on the Chicago suburban lines was done under his leadership. He lived to see his advocacy of this work fully justified.

◆

J. E. Stephenson, passenger and freight agent for the International Railway, Buffalo, N. Y., under the administration of three presidents, Hardin H. Littell, W. Caryl Ely and Thomas E. Mitten, died in Denver after a lingering illness. He was 60 years old.

◆

George Shields, Eastern sales manager for the Dayton Manufacturing Company, Dayton, Ohio, with offices in New York City, died recently Mr. Shields had been with the Dayton Manufacturing Company for ten years, prior to which he was with the American Car Company, St. Louis.

Leon M. Coe, 85 years old, Berea, Ohio, Mayor for two terms and Mayor of North Olmsted for twelve years, died on Jan. 26 after an illness of ten days at his residence in North Olmsted. He was a member of the original group of twenty men which laid out hundreds of miles of interurban lines in Northern Ohio. Among the lines were the Cleveland & Southwestern, the Cleveland & Eastern, the Western Ohio, the Chagrin Falls Line and a line south of Findlay.

◆

W. N. Colam, principally associated with the development of cable tramways in Great Britain, died recently at Hove, Sussex, England. He persuaded the Edinburgh Town Council to adopt the cable system for all its lines. He was associated with some smaller cable systems in England, but Edinburgh was the greatest development of cable traction in Britain. Mr. Colam was both engineer and manager. The undertaking was leased for private operation. Ultimately, Edinburgh overcame its deep-rooted objection to overhead trolley wires and adopted the electric system, the city recapturing the lines when the lease expired.

◆

Harrison Ricord VanDuyne, Newark engineer and a member of the North Jersey Transit Commission, is dead. Mr. Van Duyne was born in Newark 56 years ago. He spent all of his business and professional life there. He was one of North Jersey's best known civil engineers and surveyors.

◆

George L. Arnold, since 1923 purchasing agent for the El Paso Electric Company, El Paso, Tex., died recently at the age of 40, following a brief illness. He had been employed by the power company in various capacities since 1909.

◆

Jacob M. Rounds, for 30 years superintendent of the Broad Street carhouse and an employee of the United Electric Railways, Providence, R. I., for more than 40 years, is dead.

◆

Oscar F. McJunkin, formerly general inspector for the Ohio State Public Utilities Commission, died at his home in Columbus, Ohio, on Jan. 14. Mr. McJunkin was employed by the Ohio commission for many years. He was 70 years of age.

◆

William C. Willard, prominent banker and a director of the Columbus Railway, Power & Light Company, Columbus, Ohio, is dead. Mr. Willard had been in ill health for three years. In addition to his two major bank connections, Mr. Willard had been connected with a number of railroads, the Ashland Steel Company, Ashland, Ky., and the Kelley Nail & Iron Company, Ironton, Ohio. He was 58 years of age.

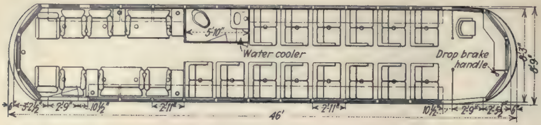
◆

S. N. Griffith, who, with the late W. H. McKenzie, established the electric railway system in Fresno, Cal., died recently in San Francisco at the age of 79.

◆

Samuel George, 62, prominent retired business man, died on Jan. 4 at his home in Wellsburg, W. Va. He was a former president of the Wellsburg, Bethany & Washington Railway.

INDUSTRY MARKET AND TRADE NEWS



Floor plan of the fourteen de luxe observation cars to be built by the American Car & Foundry Company

Indiana Railroad Orders 35 Cars for High-Speed Interurban Service

As part of its general improvement program the Indiana Railroad has ordered 35 new interurban cars which will be delivered in June. These cars will be placed on the high-speed interurban service of several of its lines from which increased riding is expected. Specifications call for all aluminum body construction and one-man operation.

This order will comprise two designs of cars. Pullman Car & Manufacturing Company will build 21 cars with a seating capacity of 40 and having a baggage compartment at the rear. American Car & Foundry Company will build fourteen cars of the de luxe type, seating 38 passengers The de luxe type will have an observation lounge in the rear. Interior design and color scheme will differ for each car. In general, the cars will be equipped with individual easy chairs, sofas, tables and shaded individual lamps. There will be no baggage handling facilities on these cars, but parcel racks will be placed in the coach compartment.

Both types of car will have a 32-volt storage battery lighting system with motor-generator sets, and will be equipped with clasp brakes and magnetic track brakes. The 35 cars will cost $950,000.

Specifications of both types of cars follow.

DE LUXE OBSERVATION CARS

Name of Railway	Indiana Railroad, Indianapolis, Ind.
Number of units	14
Type of unit	De luxe coach, one-man, motor, passenger, interurban, single end, double truck
Number of seats	38
Builder of car body	American Car & Foundry Co. Jeffersonville, Ind.
Date of order	Dec. 27, 193.0
Weight total	50,000 lb
Length over all	46 ft.
Length over body posts	45 ft.
Width over all	8 ft. 9 in.
Height	11 ft. 4 in.
Window post spacing	35 in.
Body	All aluminum
Roof	Arch, wood
Doors	End, folding
Air brakes	Westinghouse Traction Brake Co.
Armature bearings	Bronze sleeve
Axles	A.E.R.E.A. standard 5 in., heat treated
Car signal system	Faraday 32-volt
Control	Westinghouse HLF
Couplers	Tomlinson No. 10.
Curtain fixtures	Adams & Westlake
Curtain material	Pantasote
Destination signs	Hunter
Door mechanism	National Pneumatic Co.
Finish	Enamel
Floor covering	Figured carpet and linoleum
Gears and pinions	Grade M
Glass	Sides, "Duplate"; ends, non-shatterable
Hand brakes	Peacock
Heaters	Railway Utility Co., electric
Headlights	Incandescent 32-volt, 14-in. diam.
Headlining	Aluminum
Interior trim	Aluminum
Journal bearings	Plain
Journal boxes	Symington
Lamp fixtures	Electric Service Supplies Co. 6-in. dome
Motors	Four GE-706, 100 hp.
Painting scheme	Orange
Roof material	Poplar, duck covered
Sash fixtures	Adams & Westlake
Seats	Bucket type, lounge chairs and settees
Seat spacing	35 in.
Seating material	Leather, velour
Steps	Stationary
Step treads	Feralun-aluminum
Trolley retrievers	Ohio Brass Co.
Trolley base	Ohio Brass Co., Featherweight
Ventilators	Railway Utility Co.
Wheels	Rolled steel, 28 in. diameter
Wheelguards	Standard type, aluminum
Special devices	Four 10-in. fans in observation lounge

SINGLE-END INTERURBAN CARS

Name of Railway	Indiana Railroad Indianapolis, Ind.
Number of units	21
Type of unit	One-man, motor, passenger, interurban, single end, double truck
Number of seats	40
Builder of car body	Pullman Car & Mfg. Corp. Chicago, Ill.
Date of order	Dec. 27, 1930
Total weight	50,000 lb.
Length over all	46 ft.
Length over body posts	45 ft.
Width over all	8 ft .9 in.
Height	11 ft. 4 in.
Window post spacing	35 in.
Body	All aluminum
Roof	Arch, wood
Doors	End, folding
Air brakes	Westinghouse Traction Brake Co
Armature bearings	Bronze sleeve
Axles	A.E.R.E.A. Standard 5 in. heat-treated
Car signal system	Faraday 32-volt
Control	Westinghouse H.L.F.
Couplers	Tomlinson No. 10
Curtain fixtures	Adams & Westlake
Curtain material	Pantasote
Destination signs	Hunter
Door mechanism	National Pneumatic Co.
Finish	Enamel
Floor covering	Battleship linoleum
Gears and pinions	Grade M
Glass	Sides, "Duplate," ends, non-shatterable
Hand brakes	Peacock
Heaters	Railway Utility Co.
Headlights	Incandescent 32-volt, 14 in. diam.
Headlining	Aluminum
Interior trim	Aluminum
Journal bearings	Plain
Journal boxes	Symington
Lamp fixtures	Electric Service Sup. Co., 6-in. dome
Motors	Four G.E.-706, 100-hp.
Painting scheme	Orange
Roof material	Poplar, duck covered
Sash fixtures	Adams & Westlake
Seats	Bucket type
Seat spacing	35 in.
Seating material	Green leather
Steps	Stationary
Step treads	Feralun-aluminum
Trolley retrievers	Ohio Brass Co.
Trolley base	Ohio Brass, Featherweight
Ventilators	Railway Utility Co.
Wheels	Rolled steel, 28 in. diameter
Wheelguards	Standard type, aluminum

Applications for Exhibits at A.E.R.A. Convention to Be Ready Soon

Applications for exhibit space at the 50th annual convention and exhibition of the American Electric Railway Association to take place in the Atlantic City Auditorium and Convention Hall from Sept. 26 to Oct. 2, inclusive, will be sent to the membership on April 1 with diagrams showing the layout. As in previous years, 30 days will be allowed for filing the requests. At the end of that time the exhibit committee will hold its meeting for the official allotment of space. The executive committee has approved a budget for a rate of 65 cents per square foot for all exhibition space. No charge will be made for track space on the Boardwalk and side streets upon which cars are to be shown.

At a meeting held at Indianapolis in the latter part of January, the executive committee set aside Monday afternoon, Sept. 28, and Wednesday morning, Sept. 30, of the convention week exclusively for the inspection of exhibits, and urged that no meetings of any kind be held during those times. The executive committee requested manufacturers to continue their whole-hearted support of other years by abstaining from demonstrating equipment, staging exhibits in hotel rooms and other places away from the main exhibition hall, and from inviting delegates to such demonstrations and private exhibits. The committee looks upon the excessive entertainment in hotel rooms as a nuisance and contrary to good business ethics, and maintains that such practices are playing a leading part in threatening the understructure of many national conventions. Furthermore, it continued, such demonstrations tend to defeat the purpose of the convention and lead to excessive and unnecessary expense.

Copies of the resolutions the executive committee passed at this meeting were sent by the general secretary of the association to all members, to the Atlantic City Convention & Publicity Bureau, to the public authorities in Atlantic City, and to the management of all hotels in that city.

◆

One-Man Operation Recommended for Rochester

More general use of one-man cars was recommended by Charles R. Barnes, city commissioner of railways, in one of his recent quarterly reports. As a result, an experiment that is likely to bring about important changes in the operation of the Rochester lines of the New York State Railways has been put into effect with the beginning of one-man car service on the Lake Munroe line, the heaviest and most profitable in the Rochester system. The line runs from Rowlands, on the southeastern edge of the city, to Lake Ontario, a distance of more than 14 miles.

If the Lake Munroe service proves successful, officials of the railway said that the one-man system would be extended to other important lines. Benjamin E. Tilton, president and receiver of the railways, recently petitioned the federal court for permission to substitute one-man car service.

Ohio Brass Buys Line Materials Business of General Electric

General Electric Company has disposed of its trolley line material business to the Ohio Brass Company, Mansfield, Ohio. The products taken over include overhead line materials for electric railways, electrified mines, industrial haulage and electrified steam roads.

The Ohio Brass Company has specialized intensively in this field for many years. Although the volume of business involved in the transaction is relatively small, the users of line material will be greatly benefited because of the increased service that can be rendered under the new arrangement.

◆

Westinghouse Groups Railway Activities in One Department

Grouping of certain closely related engineering activities into a new railway engineering department with headquarters at East Pittsburgh is announced by the Westinghouse & Electric & Manufacturing Company. The departments affected by this merger are the railway equipment and railway motor engineering departments; railway engineering of the general engineering department; the traction and mining division of the control engineering department; the overhead line material section of the supply engineering department, and the trolley design section of the gearing engineering department.

Frederick Urban, assistant to the vice-president, will have charge of the new department, and the following appointments have been announced in connection with the new arrangement. These appointments are now effective.

Francis E. Wynne will be assistant general manager; Claude Bethel will be division engineer in charge of the equipment and control division; Sidney B. Cooper will be division engineer in charge of the project and motor division; Lynn G. Riley will be assistant division engineer on control; Lloyd J. Hibbard will be special engineer; Edwin Tidlund will be mechanical engineer in charge of all drafting and Fred J. Guthoehrlein will be office manager.

◆

Pittsburgh Selected for Regional Meeting of A.S.T.M.

For its regional meeting and dinner to be held on March 18, the American Society for Testing Materials has selected the Hotel William Penn in Pittsburgh. The meeting itself will be a symposium on welding. During the morning session, processes, materials and applications of welding will be considered by five papers. K. G. Mackenzie, president of the society, will preside as chairman. The topics to be covered in the papers are the following: General survey of welding processes; welding processes applicable to aluminum; the quality of material for fusion welding; modern applications of arc welding; and recent developments in gas welding and cutting.

F. M. Farmer, past president of the society, will preside at the afternoon session which will cover the general topic of inspection and testing of welded products. The papers to be presented at this session will cover stethoscopic examination of welded products, tests of welding made by the Watertown Arsenal, magnetic methods of testing butt welds, fatigue and impact test of welded products, and welding in-

The program for the evening includes an informal dinner followed by a motion picture showing the influence of electrical developments on modern civilization, and a demonstration to be offered by the Westinghouse Research Laboratories of the production and analysis of sound and music.

◆

"Keep Up Public Confidence" Is Message to the Industry

In a letter to all member companies of the American Electric Railway Association, addressed by William Butterworth, president of the U. S. Chamber of Commerce, it is urged that the reinforcement of public confidence is at present the most essential factor in the resumption of normal business activity. The board of directors of the Chamber of Commerce has reached this conclusion after a study of reports from constituent member organizations in all parts of the country. A majority of the reports indicate a slight increase in business activity and an improvement in the employment situation. These facts, the statement points out, justify the hope that the dead-center of the depression is past.

Four Electric Locomotives Shipped to the Chilean State Railways

Four electric locomotives, built on the first order ever received from Chile by telephone, were recently shipped to Chilean State Railways system, which is said to be the only government-owned railroad operating at a financial profit.

Electrical equipment was built and installed by the Westinghouse Electric & Manufacturing Company, and the cabs and mechanical parts were built by the Baldwin Locomotive Works. The *Belray* of the Christian-Smith steamship lines came from European waters to transport the locomotives to South America because it is the only vessel with hatches that permit the loading of the large cabs below deck. The locomotives were loaded on the *Belray* in Philadelphia, and after approximately 30 days on the water reached Chile. They were put in service on 110 miles of the main line of the Chilean State Railways system between Santiago and Valparaiso within a few hours after being unloaded.

This line runs through rough section of country where grades of 2½ per cent must be negotiated. The line has a wide-gage track, 5 ft. 6 in. between rails. The locomotives will haul express-passenger trains on a scheduled speed of 35 m.p.h. and a maximum free running speed of 60 m.p.h.

The locomotives are duplicates of six other locomotives built for the same system when it began to electrify its lines in 1921. Westinghouse received the half-million dollar order for the locomotives by telephone from Chile a few days after that service was established. This is the first contract awarded by telephone between Chile and the United States.

Each of the four 130-ton, 3,000-volt d.c. locomotives has six 375-hp. motors. Several improvements have been made over the initial order. The motors have oil-sealed bearings with oil reservoirs which permit operation for several months without oiling. Forced grease lubrication has been adopted. The locomotives have been designed for multiple operation so that double headers can be handled from a single control stand. It is planned to place them in service on the high-speed passenger line of the Chilean State Railways within a few days of their arrival.

In answer to a telephone call from Chile, four 130-ton electric locomotives started from Philadelphia on their 30-day sea voyage on the "Belray"

El Paso Rebuilds Ten Birney Cars

Ten one-man Birney cars were recently rebuilt by the El Paso Electric Company, El Paso, Tex., in its own shops for use on the Government Hill line, one of the principal lines serving the residential district of El Paso. The cars were purchased in February, 1918, and were the first one-man safety cars to be operated in El Paso. The rebuilding extended over a period of three months. The truck frames were made 2 ft. longer with new and heavier steel channels. New half-elliptic springs replaced quarter-elliptic springs to give the car body a four-point suspension on each end instead of the two-point suspension. Increase of truck wheelbase has added to riding comfort.

Each of the cars was completely overhauled, new flooring installed and all other necessary repairs made. Air and electrical equipment were thoroughly reconditioned and cars repainted. Roof and trucks were painted black, and body painted light orange. The rebuilt cars were equipped with new wheels, gears and pinions.

TRADE NOTES

St. Louis Car Company has elected Howard G. Gass to the board of directors, succeeding George W. Scroogs, former secretary and treasurer. The board appointed Louis F. Gempp, formerly assistant treasurer, treasurer; Edward J. Clowden, former assistant secretary, secretary; and John F. Pringle, assistant treasurer.

◆

Fairmont Railway Motors, Inc., has appointed Ward G. Day district manager with headquarters at 1218 Olive Street, St. Louis, Mo., to succeed Lee R. Payton who recently died.

◆

Ohmer Fare Register Company declared its regular quarterly dividend of $1.75 on preferred stock, which was payable Feb. 2, and also 50 cents on the common stock payable March 1. Common stockholders were permitted the selection of common stock at $16 per share, or the 50-cent dividend per share.

◆

Westinghouse Electric & Manufacturing Company announces the purchase of the Hessel & Hoppen Company, electrical jobbers, of 240 Cedar Street, New Haven, to take effect March 1.

◆

Star Brass Works, Kalamazoo, Mich., announces the appointment of A. C. Sullivan, of Cleveland, Ohio, as manager of sales. Mr. Sullivan was formerly with the Holland Trolley Supply Company of Cleveland. The Star Brass Works is a manufacturer of trolley wheels and has been serving the industry for many years.

◆

Pacific Coast Steel Corporation has obtained a contract for 200 33-in. steel car wheels for the Municipal Street Railway of Seattle, Wash.

Weyrhauser Sales Company announces the appointment of Ray V. Clute as manager of cedar pole sales with headquarters at Chicago. For several years Mr. Clute was sales manager of the Weyrhauser Northern Pine Mills.

◆

Bethlehem Steel Company has appointed Jesse V. Honeycutt, formerly sales agent in New York City, manager of sales for frogs and switches. He succeeds Mr. Neile Salfich who resigned to become vice-president in charge of sales of the Jeffrey Manufacturing Company.

◆

Worthington Pump & Machinery Corporation announces the appointment of H. C. Beaver, formerly executive vice-president of Rolls-Royce of America, as a new vice-president. He will supervise the administration of the sales department. E. E. Yake was advanced to the office of vice-president to direct manufacturing and engineering, as formerly.

Welding Society Formed in St. Louis

On Jan. 23 the St. Louis Welding Society was formed and officers elected. This society was the outgrowth of monthly meetings on the subject of welding conducted by the Hill Equipment Engineering Company, St. Louis. It consists of 65 charter members representing 26 companies in St. Louis, East St. Louis and Madison, Ill. Temporary headquarters of the society were established at 4620 Delmar Boulevard, the home of the Hill Equipment Engineering Company. E. P. Barnes, of the Maloney Electric Company, was elected president, and W. E. Patterson, American School of Welding, vice-president. Activities will include plant inspections and lectures on welding subjects.

Ohmer Men in Convention

Branch managers of the Ohmer Fare Register Company met in convention recently at the factory in Dayton. Announcement was made of the development of several new products, which, it is expected, will greatly increase the scope and volume of the company's business during 1931. New types of recording instruments for charting the operation of vehicles or machinery of any kind were announced in addition to a new line of fare registers.

A dinner was given in honor of John F. Ohmer, president of the company, on the 61st anniversary of his starting in business. More than three hundred guests attended, including the convention delegates and all employees who had been with the company for ten years or more.

In his address, Mr. Ohmer analyzed the business situation as follows:

> I take no stock in the people who are continually harping on hard times; if we make up our minds to reach the right goal we will get there. I have no patience with those who give us every imaginable cause for bad times. If we take them seriously we find ourselves in a serious predicament. Business depression is a necessary aftermath of the World War and my opinion is that there is no effective panacea or antidote. It's like water in the pond. It's muddy, but it will clear up in due time. Agitation only makes it worse. We must deal with the situation as it is, make the best of it, work cheerfully and a bright future will reward us.

ADVERTISING LITERATURE

Angle steel and sheet metal equipment for factory, shop and office use are listed, with prices and brief descriptions, in Catalog M-S of the Angle Steel Stool Company, Plainwell, Mich.

◆

Vulcanized fiber is a comprehensive catalog of fiber products offered by the Continental-Diamond Fiber Company, Newark, Del. This catalog covers a large variety of products, ranging from armature wedges to wheels.

◆

Watt-hour meters and demand meters, and a detailed description of the new detachable watt-hour meter are described in Circular 1753-B, offered by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

◆

Switches of all types are described and illustrated in catalog No. 31 of the Consolidated Car Heating Company, Inc., of Albany, N. Y.

◆

Rail bonds and bonding tools are described and illustrated in catalog No. 234 offered by Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

◆

Arc-Welding Supplies offered by the Lincoln Electric Company, Cleveland, Ohio, describes welding equipment in detail.

◆

Mack motor vehicles of numerous types and models are described in Catalog No. 2, which is offered by the Mack Trucks, Inc., 25 Broadway, New York.

◆

Overhead lines, track and equipment products of the Ohio Brass Company, Mansfield, Ohio, which have been developed recently are described and illustrated in the Products Catalog No. 4.

Electric Railway Material Prices
February 26, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	10.25
Lead, cents per lb.	4.60
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	4.30
Tin, Straits, cents per lb.	27.50
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	34.50
General service	29.00

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	1.25
Kansas screenings, Kansas City	1.50
Big Seam, Ala., mine run	1.50
Smokeless mine run, Chicago	2.00

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, 9/16-in. and larger, per 100 lb.	2.80
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	1.35

Hardware—Pittsburgh

Wire nails, per keg	$1.95
Sheet iron (24 gage), cents per lb.	2.35
Sheet iron, galvanized (24 gage), cents per lb.	2.90
Auto body sheets (20 gage), cents per lb.	3.30

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	8.00–12.00
Colored	7.00–10.00

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	9.8
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), per gal.	41.00
Putty, 100 lb. tins, cents per lb.	5.50

Wire—New York

Bare copper wire, cents per lb.	12.25
Rubber-covered wire, No. 14, per 1,000 ft.	$4.65
Weatherproof wire base, cents per lb.	13.00

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b	1.95
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt, in pkg.N. Y., f.o.b. ref. per ton	16.00

Scrap Metal—New York

Heavy copper, cents per lb.	7.00
Light copper, cents per lb.	6.00
Heavy brass, cents per lb.	4.00
Zinc, cents per lb.	2.25
Lead, heavy, cents per lb.	3.00
Mixed babbit, cents per lb.	3.25
Battery lead plates, cents per lb.	1.00

Old Material—Chicago

Steel car axles, net ton	$12.25
Cast iron car wheels, gross ton	10.75
Steel car wheels, gross ton	13.25
Leaf springs, cut apart, gross ton	13.25
Angle bars, gross ton	11.25
Brake shoes, net ton	7.50
Steel rails (short), gross ton	12.75
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	4.50

WITH
increasing
TRAFFIC HAZARDS

The populace of every city in the country is clamoring for accelerated movement of vehicles.

With this increased speed comes increased accident hazards. And with increasing traffic hazards you need emergency brakes that will act under any conditions.

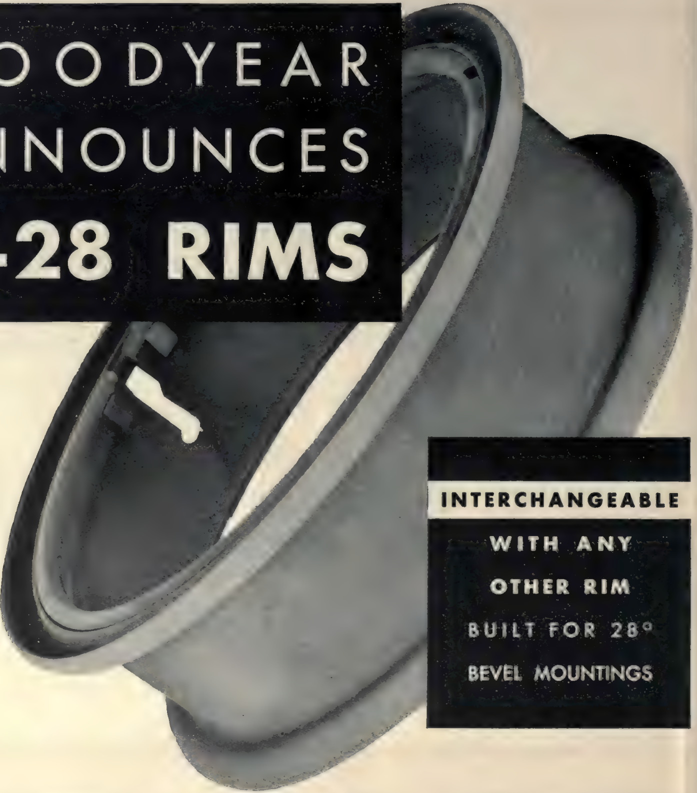
Specify "Peacock" Staffless Brakes

"PEACOCK" STAFFLESS BRAKES

National Brake Company

890 Ellicott Square, Buffalo, N. Y.
Canada:—Lyman Tube & Supply Co., Ltd., Montreal
General Sales Office: 50 Church Street, New York City

GOODYEAR ANNOUNCES
K-28 RIMS



INTERCHANGEABLE
WITH ANY
OTHER RIM
BUILT FOR 28°
BEVEL MOUNTINGS

K-28 comes as the answer to a request from truck, bus and trailer manufacturers and operators for interchangeable rim equipment.

This new Goodyear K-28 rim enables truck, bus and trailer factories to supply Type "K" advantages as original equipment on wheels made for 28° bevel rims.

It enables manufacturers and owners of vehicles equipped with 28° bevel rims to use Goodyears and learn the superiority of Type "K" split-base construction.

K-28 takes its place as the running mate of K-18 (formerly called Type "K"). Both rims operate alike—both have the easy operation, the safety, the quick application and quick removal of tires which have won a place on over 30 makes of trucks, buses and trailers as original equipment.

K-18 sizes: 5", 6", 7", 8", 9-10" and 11".

K-28 sizes: 5", 6", 7", 8" and 9-10".

They cost no more than other rims —and the "K" type rim is the only rim providing the same design for large and small wheels.

The Goodyear Tire & Rubber Co., Inc., Akron, Ohio.

THE MAN WHO CHANGES THE TIRES LIKES GOODYEAR "K" RIMS

GOODYEAR

K-28 RIMS K-18

Teche Lines Inc. operates a fleet of
130 buses out of New Orleans, La.

450,000 miles a month

on hot dirt and gravel roads

"Our fleet absorbs 450,000 miles per month, in four gulf states, over roads which are almost entirely gravel or dirt," says a letter from Teche Lines Inc., of New Orleans. "We have never been forced to use chains, due to the sure-footed traction which the Goodyear tire affords and which the safety of passengers demands."

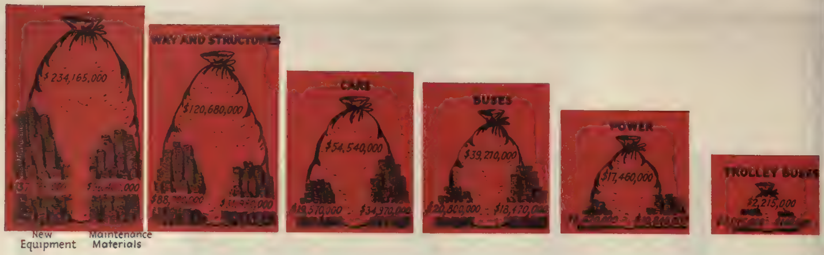
"In spite of the fact that the atmospheric temperatures are high during the entire year, and that our hauls are long and at high speed, our road delays from tire faults are almost negligible."

Hundreds of statements from transportation companies show how well Goodyear Bus Balloons stand up under the harsh treatment of long, high-speed runs—or under continuous stop-and-start punishment in city traffic.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS



The 1931 Budget for New Plant and Equipment and Maintenance Materials

A BIGGER program

ADVERTISERS: The Maintenance Number offers one of the most profitable and timely advertising opportunities of the year. Forms close March 20.

ELECTRIC RAILWAY

this year than last year

The 1931 budget of the Electric Railways for extensions, betterments and maintenance totals $352,650,000—

$13,515,000 more than last year's expenditures—

Bigger amounts for every capital account—a larger sum for maintenance labor—

$96,400,000 for maintenance materials alone.

How are these huge sums being spent?

What progress has been made in maintenance methods during the past year? What improvements in maintenance materials? What are the current trends in construction?

The answers will be in the Annual Maintenance Number of ELECTRIC RAILWAY JOURNAL, published next month.

The vital importance of good maintenance methods and materials to operating success is emphasized by present conditions. Every electric railway man responsible for maintenance will want to study and *keep* the April JOURNAL.

JOURNAL

THE

ANNUAL

MAINTENANCE

NUMBER

—APRIL

ROAD DELAYS NOW AN *EVENT*

because of Firestone's Exclusive Features

There was a time when passengers and operators alike thought there simply *had* to be road delays.

But no more! Not since fleets discovered how Firestone Bus Balloons and Firestone Service make "road failures" pretty much a thing of the past.

Operators have found that Firestone Gum-Dipped Balloons give *greater mileage* with less upkeep cost. Gum-Dipped Cords (exclusive Firestone feature), and the Patented Double Cord Breaker, which provides two extra plies under the tread, make them *tougher* for *longer* wear.

Your own fleet can profit by Firestone Service. Specify Firestone Tires, Puncture-Proof Tubes and Rims for complete equipment—and watch delays and expenses drop.

For example—A fleet of 115 buses using Firestone Tires and Service travelled 3,254,591 bus miles with only 27 road delays—less than one for each 120,000 miles. Upon request we will gladly send name of operator and full data.

Firestone

BUS BALLOONS

BATTERIES • BRAKE LINING • RIMS • ACCESSORIES

Methods
Materials
Machinery
Power Equipment
Material handling
Power drives
Tools
Lubrication
Lighting
Ventilation

NOW
FOCUS ATTENTION ON LUBRICATION

PLANT executives, in their efforts to increase net profits must dig deeper than major elements of production costs. It is necessary tc carefully scrutinize minor cost items . . . for instance, lubrication.

Small as the item of lubrication is, compared with many items of factory expense, it wields a surprisingly great influence on the cost and efficiency of plant operation. Savings in power cost per KWH . . . savings in repair bills . . . savings in maintenance . . . savings in the cost of lubrication . . . all are possible through improved methods of lubrication.

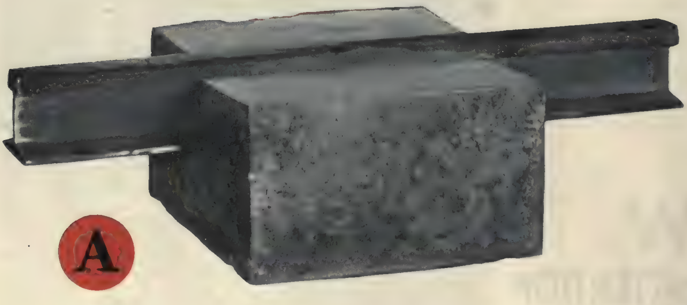
Your factory, like any other, has its peculiar lubrication problems. We suggest that you allow our engineering staff to make a lubrication survey and advise you as to the most efficient and economical practices. These men know how to diagnose lubrication troubles and how to apply the proper remedies. They have the highest grade lubricants to work with and the cooperation of our great research laboratories.

One of these men will be glad to talk to you . . . at your convenience . . . without obligating you in any way.

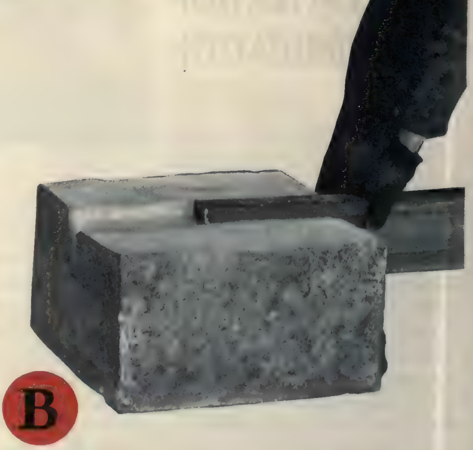
STANDARD OIL COMPANY *(Indiana)*
910 South Michigan Avenue Chicago, Illinois 1103

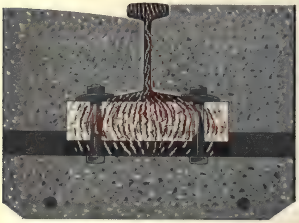
LUBRICANTS
FOR EVERY
INDUSTRIAL
PURPOSE

Rail vibration in



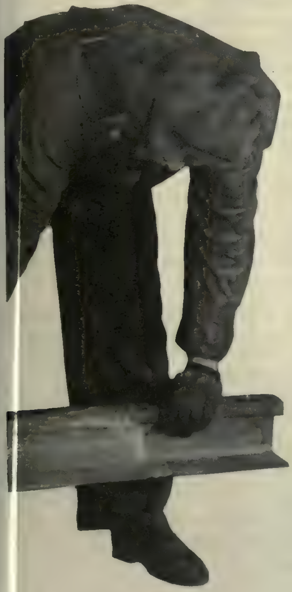
This same separation of concrete from the rail takes place in all paved track installations subject to traffic vibration—but only with Dayton Ties is this separation absolutely barred from further damage to the foundation structure. In fact, such separation is of distinct benefit to Dayton Ties for the reason that the traffic load is then directly imposed on a shock absorbing asphalt fibre block which absorbs all traffic vibration, assuring absolute protection to the concrete and lifelong tightness of the entire structure.

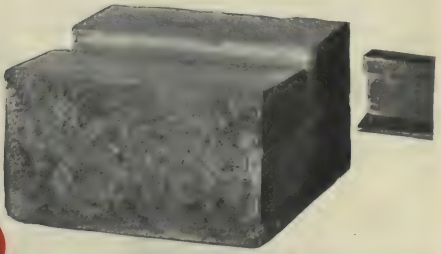




results *demonstrated interesting test*

Five concrete blocks were constructed, with steel rails imbedded as shown in Photograph "A." These blocks were allowed to season for twenty eight days. A vibrating machine was then placed upon the rail and it was vibrated to simulate the vibration set up by car traffic in actual operation. This vibration was applied to the rail for twenty hours or the equivalent of approximately thirty days car traffic. As a result, a hair crack appeared between the rail and the concrete after five hours and the rail was completely removed by hand after twenty hours vibration.





C

THE DAYTON MECHANICAL TIE COMPANY
DAYTON, OHIO

DEVELOPING A WORKABLE PROGRAM FOR IMPROVED PUBLIC RELATIONS - - -

Speaking of the fall elections and their effect on the public utilities, the Electrical World says: "Part of its (the light and power industry) task is to conduct its affairs so that it will win public approbation and not public condemnation. Utility management has failed to measure up to this responsibility even though management sins were more those of omission than those of commission and were natural and understandable. *The industry should marshal its leadership immediately for developing a positive and workable program for improved public relations."*

Every program for promoting better public relations should take into consideration the matter of pole lines. Very often pole lines arouse public disapproval. A demand arises for underground construction. But it is not wires people object to so much as unsightly poles.

Union Metal offers you a way to build good will, a way of demonstrating your interest in the public through more attractive pole lines. Fluted Steel Poles are essentially attractive. They dress up the streets. And because this one type of pole may be used for distribution lines, trolley span wires, street and traffic lights, fewer poles are necessary.

An installation of Union Metal Fluted Steel Poles has the whole hearted support of city officials, property owners and citizens in general.

Such installations are an important part of what Electrical World has termed "a positive and workable program for improved public relations".

THE UNION METAL MANUFACTURING CO.
GENERAL OFFICES AND FACTORY · CANTON, OHIO

SALES OFFICES · New York · Chicago · Boston
Los Angeles · San Francisco · Seattle · Dallas · Atlanta

DISTRIBUTORS: General Electric Merchandise Distributors · Graybar Electric Company, Incorporated
Offices in all principal cities

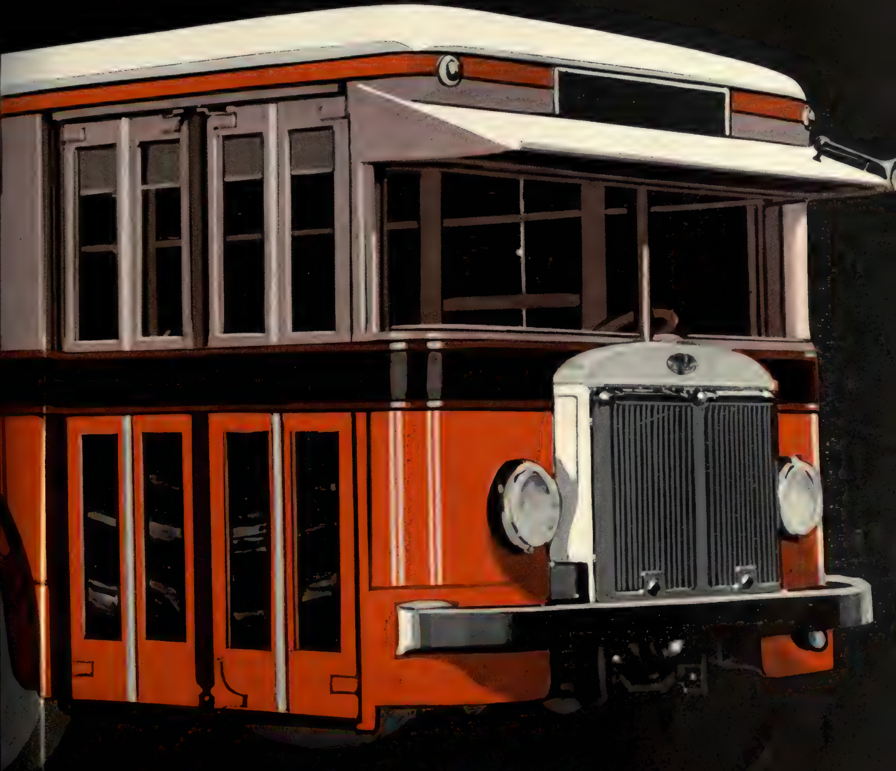
UNION METAL DISTRIBUTION POLES

Mack

NOW A MACK STREET CAR

COMPLETELY MACK BUILT

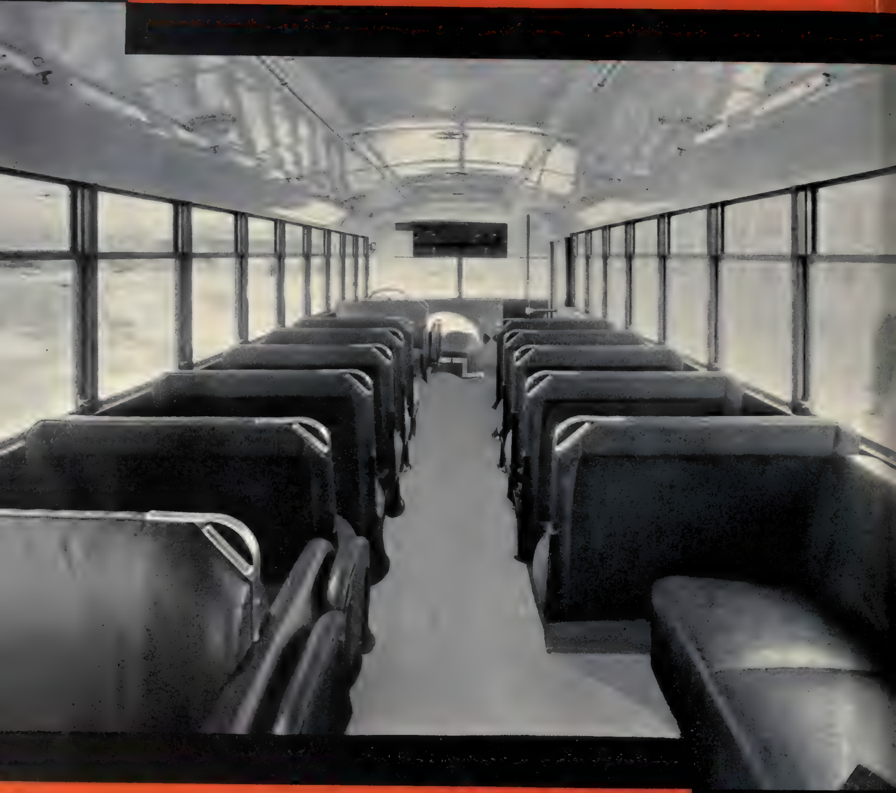
US_44 SEATED PASSENGERS



BODY AND CHASSIS

Standard Mack BK 120 H. P. Engine
Standard Mack Transmission
Standard Mack Rear Axle

Single Engine **One Man Control**
Air Brakes
196 inch Wheel Base **26 ft. 6″ Turning Radius**



44 Seated Passengers

There is a Mack to meet every economic need of the industry. Four and six cylinder buses 21 to 44 passenger capacities.

Supplement to ELECTRIC RAILWAY JOURNAL, March 1931.

A PLATFORM
FOR
AMERICAN BUSINESS

A Statement of Underlying Principles with some Practical Suggestions to Guide in Planning Future Progress

PRESENTED BY McGRAW-HILL PUBLISHING COMPANY, INC.

THE BUSINESS DEPRESSION of 1930 was no mere passing episode. The appalling loss and suffering entailed have struck home the more forcibly because they followed a period of unparalleled prosperity in a country that still possesses vast wealth and abundant resources. As a result of its duration and severity, the depression has shocked business, governmental and social agencies into commendable activity for the relief of human suffering and distress.

But, what is more significant for the future, it has also aroused an insistent demand for a searching analysis of the weak spots of the business and economic systems under which such a calamity was possible. It is an encouraging sign that men are beginning to question whether these recurring periods of boom and depression are not preventable; whether it is possible under better management to insure greater security to all classes of people who are willing to work; whether their faith in American achievement and standards of living can be preserved.

Evidence is multiplying that these questions can be answered in the affirmative; that this challenge to the American business and economic systems can be met in such a manner as to justify our confidence in them. Instead of regarding business depression as a storm to be weathered or a condition that must be endured and allowed to "work itself out," thinking men are beginning to look upon it as an economic plague that can be averted and wiped out by preventive measures. Sentiment is stirring in favor of doing something about it, heeding the warning of our latest experience and preparing actively to meet the issue it raises.

It is the responsibility of the business press to crystallize constructive policies and to encourage progressive leadership. Therefore, the McGraw-Hill Publishing Company desires to do its part in helping to clarify the situation and to stimulate thought and action. It believes in the philosophy of individual enterprise and co-operative effort on which American achievement has been based. And it has confidence in the ability of American management to recognize and adopt sound economic principles as a basis for constructive business policies. But it is equally certain that only by conscientious effort on the part of each business unit, large or small, can American business as a whole return to normal and pursue a steady course.

PLANNING IS ESSENTIAL for uninterrupted progress. To assist in such a program the McGraw-Hill Publishing Company offers through its publications the following principles and practical suggestions as a guide in formulating individual plans. They are not presented as a ready-made formula for success, but as a foundation on which business can be built with some protection from the shocks and dislocations that have plagued it.

B. Each business enterprise has a responsibility to aid in the development of regional and national resources.

Development of National Resources

(1) Encourage and cooperate in the coordination and promotion of the economic area in which you are located through constructive programs for the improvement of agricultural, commercial, industrial and community development. (*Example*—New England Council.)

(2) Assist in the work of national associations devoted to the improvement of business ethics, the promotion of higher standards in the commercial, industrial, financial and political administration of the country, and the simplification of the laws governing business. (*Example*—Chamber of Commerce of the United States.)

IV—Maintenance of World Business

Probably the greatest potential market for present and future American products lies in that foreign field represented by the present difference between the living standards of the American public and those of a billion and a half people in many other countries. Any slight increase in the living standards of these vast populations will bring immediate benefits to American manufacturers, as the largest producers of those commodities contributing to labor saving and luxury.

A. Support cooperative studies and formulation of world policies among business interests through international business organizations on such subjects as —

International Business Cooperation

(1) World tariffs.
(2) Trade discriminations.
(3) International movement of capital.
(4) War debts and reparations.

B. Promote uniformity in foreign trade practice by encouraging coordination among organized industries.

Sales Control

C. Carry this long term planning into sales control, involving distribution methods, sales forecasting and pricing.

(1) Revise present methods of distribution and service to conform to the best interests of the customer. (*Example*—establishment of retail stores by mail order houses.)

(2) Prepare sales forecasts by products and by markets with regard to competition. (Leading institutions have found that modern sales forecasting can be correct within 2 to 3% for a year ahead and within 5 to 15% for three years ahead.)

(3) Know costs and stop selling at a loss. Maintain firm minimum prices based on production costs. (Business history shows a high degree of prosperity among those companies, large or small, which have had the courage to stand on a minimum price that insured a profit.)

(4) Plan sales organization, sales program and advertising on at least a three-year basis.

Production Modernization

D. Plan for uniform production as far ahead as possible on the basis of sales requirements already determined.

(1) Modernize and replace every existing production facility, including plants, factory and office equipment and methods where it is possible to effect cost reduction and greater production flexibility. (Stores, banks, and offices have a production problem no less than factories.)

(2) Do not expand production facilities in the mere hope for lower costs through larger production, but only where the long term forecast shows the necessity for additional facilities.

(3) Base purchase of materials, supplies and equipment upon the marketing and production program for the three-year period and make purchases as far ahead as practicable.

Financial Policies

E. Stabilize financing. Working capital requirements for labor and material, and business capital requirements for development and expansion, can be determined with reasonable accuracy for a period ahead by long term planning.

(1) Do not depend permanently upon bank credit for purposes other than short-term loans for current working capital. (In the interim partial payment financing of equipment, etc., is widely accepted as sound business practice.)

(2) Raise needed fixed capital requirements by bond or stock issues whenever reasonably advantageous.

(3) Invest surplus in short-term commercial paper or good bonds rather than employing it in call money or for purely speculative purposes.

Many of America's soundest corporations have adopted these financial policies.

GENERAL OBJECTIVES

The following general objectives are fundamental in planning sound business developments:

1. Maintenance of Established Standards of Living

The belief that there is danger of a general overproduction of wealth, that technical development necessarily involves unemployment, or that standards of living cannot be indefinitely increased is an economic fallacy. American business should not yield to it in any of the policies it pursues. Rather it must protect and preserve our economic standards and social traditions by maintaining high purchasing power and regularity of employment and dividend disbursements, based on more stabilized methods of management and financing made possible by long-term planning.

RECOMMENDATION: Conserve and add to the gains achieved in the past ten years through technical advance, improved forms of industrial organization and methods of management, and new devices for financing industrial and market expansion. Increase efficiency in the economic production and distribution of goods and services so as to facilitate their widest possible consumption and thereby raise the standard of living of the American people.

2. Stabilization of Future Business Growth

So long as there are wide fluctuations in business and in price levels, the gains to some groups are cancelled by losses to others and there is no net gain to the country as a whole. The interests of the speculative and creditor groups should be subordinated to the interests of those concerned with the production and distribution of goods and services. The latter should have a larger measure of leadership in business policy to insure sound and lasting prosperity.

This leadership can be exercised only by a more deliberate process of long term planning and organization for the direction and development of business operations. Such effort involves market analysis, sales control, product development, modernization of factory and office methods, foresight in purchasing, long-term financing of fixed capital requirements and a stimulated program of capital investment in 1931 for the restoration of business volume. All this must be supported by broader policies of coordination within the industry or trade, cooperation with labor and participation in the organized development of regional and national resources.

RECOMMENDATION: Direct individual and organized effort to check excessive and unbalanced industrial and financial expansion, and prevent wide changes in price levels. This will remove the incentive to speculative gain, avoid conflict of creditor and debtor groups, and promote confidence in long-term investment and borrowing. It will also encourage productive and commercial enterprise, maintain a steady increase in consumer purchasing power and stabilize business progress.

3. Promotion of International Business Cooperation

The world is economically interdependent. Though the United States is the dominant factor in world prosperity, she cannot maintain or increase her own prosperity indefinitely without sharing it with the world, nor can her business system survive unless, by sharing its benefits, the other nations of the world can preserve their faith in it. This calls for a more active policy of international cooperation on the part of American business to assist in the gradual reduction or removal of unnecessary trade barriers that interfere with the natural exchange of goods and services between peoples, the development of a more stabilized international mechanism for the movement of capital and control of credit, and the revision of war debts and reparations.

RECOMMENDATION: Support individual or organized effort to promote cooperation among business and financial interests of the United States and other countries, in order to facilitate the normal international movement of goods, services and capital, and there by enhance economic stability at home and elevate standards of living abroad.

4. Encouragement of Private Initiative and Responsibility vs. Extension of Governmental Activity

American business should encourage self-government. It has already shifted enough of its responsibility and thereby yielded enough of its initiative to government and must stand its ground against further extension of governmental action in matters in which it can assume responsibility itself.

The essential function of government is to keep clear the field of economic activity for private business initiative and to assure a basis of fair and equal competition in domestic and foreign trade. It should refrain from competing with any kind of business itself. It should facilitate and encourage the development of necessary controls upon business through organized self government. It should safeguard the economic stability of the country by maintaining stability in its own fiscal and international policies. It should reduce to the minimum the number of laws affecting business.

RECOMMENDATION: Oppose governmental regulation, control or expenditure which tends to limit or weaken private individual initiative or cooperative effort, or to diminish the responsibility of the individual business concern or organized industry, for the accomplishment of the objectives stated above.

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RESPONSIBILITY FOR ACTION

This course of action for (1) the maintenance and elevation of American standards of living, (2) the stable development of American business, (3) the promotion of international cooperation and (4) the restriction of governmental encroachment upon private initiative and cooperative effort cannot be carried out without the earnest participation of individuals and organized groups representing all types of business and industrial activity.

Upon the following major groups the main burden of responsibility rests:

A. Industrial and Business Management: A few thousand business concerns in this country employ the bulk of the wage-earners, originate most of the consumer income, and produce the chief part of the goods and services that determine the standard of living. Upon the management of these concerns therefore rests the main responsibility for action that will:

(1) Formulate long-term plans for research, production, distribution, purchasing and financing.
(2) Support cooperative effort through industrial, trade and commercial organizations.
(3) Maintain wage scales that permit a high standard of living and purchasing power.
(4) Maintain and equalize employment by adjustment of working hours.
(5) Establish a reserve to protect the security of employment in times of reduced production.
(6) Establish and maintain stable prices.
(7) Maintain reasonable, stable dividends, conserving surplus accumulated in periods of prosperity for such use in slack times.

B. Industrial, Trade and Commercial Organizations: The power of business units is multiplied and their leadership is strengthened by vigorous, intelligent and far-sighted trade organizations. Through them it is possible to carry the foregoing principles into action on an industry-wide basis, which is necessary to their realization in each industry as a whole and to the even balance among all industries requisite to stable progress. They should cooperate in:

(1) Collection of data on costs, stocks, production, potential productive capacity and market conditions.
(2) Interchange of credit information.
(3) Development of codes of practice.
(4) Establishment of standards of employment salaries and wages within the industry.
(5) Development of opportunities for stabilizing business.
(6) Study of market development.
(7) Economic development and use of natural resources.

A CHECK SHEET
# of Practical Suggestions
for Planning a
Company Program

I—Long Term Planning of Business Operations

A. Definitely abandon the yearly period as the basis for business operations, except in accounting matters.

(1) Project business policies and planning, wherever possible, upon a three-year period or longer as a unit.

B. Initiate research from the customer's standpoint to determine:

Analyzing the Business

(1) To what extent established lines should be replaced, improved or simplified.

(2) What additional markets can profitably be penetrated with these lines.

(3) What new products can logically be added for present and new markets.

II—Coordination with Industry or Trade

A. The success of long term planning for an individual business is multiplied and secured when similar policies are established throughout the industry.

(1) Aid in the establishment and share in the active development of an industry, trade or commercial organization —
    (a) to collect data on costs, stocks, production, potential productive capacity and market conditions.
    (b) to interchange credit information.
    (c) to develop codes of practice.
    (d) to take full advantage of legal trade cooperation.

(2) Cooperate to establish standards of employment, salaries and wages within your industry. (Labor is particularly susceptible to advantages offered by a business where long-term planning gives stable employment.)

III—Promotion of National Prosperity

A. The net profits of a modern business depend not only on its own activities but on sustained business stability throughout the country. There is a vital responsibility upon each business enterprise to do its share to provide national stability of purchasing power through —

Stabilization of National Purchasing Power

(1) A policy for employment.
    (a) Establish a minimum payroll based on the planned program of production and sales and consider this minimum payroll as a fixed charge on the business. (*Example*—the Procter & Gamble plan.)
    (b) Maintain a salary and wage scale that permits a high standard of living and thus of purchasing power.
    (c) In slack periods, preserve the organization of trained personnel by reducing hours of work per man rather than reducing number of employees.
    (d) Set up a reserve to protect the security of employment in times of reduced production.

(2) A policy for dividends.
    (a) Resist the temptation to pay out excessive sums in dividends in boom times. Rather place excess earnings in reserve and do not hesitate to use this reserve in slack times to maintain national purchasing power through dividend disbursements. (*Example*—U. S. Steel Corp. policy.)

C. Banking and Financial Institutions: Next to the will and intelligence of individual and organized business, the most important factor in achieving the four objectives of this platform is the understanding and cooperation of the banking system in checking excessive inflation in times of prosperity and excessive deflation in times of depression. In the exercise of this function, business itself may well expect banking and financial institutions to:

(1) Require business management to think in terms of long-time planning where financial assistance is provided.
(2) Encourage corporations to accumulate substantial reserves in good times to be used in slack times for development and dividends.
(3) Discourage the extension of excessive credit in periods of unusual prosperity and in like measure facilitate legitimate credit in times of stringency.
(4) Assist in the promotion of mergers where real benefits can be obtained but oppose the merging of corporations for stock selling purposes.
(5) Lead in the development of international financial cooperation.

D. Labor: Stability of industrial and business operations requires a sympathy by American workers with the policies expressed in this platform, and a willingness to cooperate in making them effective. Responsibility rests upon labor as well as upon management if the worker is to enjoy the benefits of our business system. To this end labor should actively support these principles:

(1) That increased wages are dependent upon increased efficiencies in production and distribution.
(2) That business must be conducted profitably if labor is to enjoy higher standards of living.
(3) That employers operating on a program of long-time planning provide the maximum stability of employment.
(4) That labor should demand of their leaders an understanding of sound business principles.
(5) That the welfare of labor will best be served by recourse to arbitration and the avoidance of industrial strife.
(6) That the development of international trade is essential to domestic prosperity.
(7) That the extension of governmental activity hampers business in assuming its social responsibilities.

E. Government: The essential function of government is to keep clear the field of economic activity for private business initiative and to assure a basis of fair and equal competition. It can best promote sound economic development through these policies:

(1) Refrain from competing with any kind of business itself.
(2) Encourage the development of the necessary control of business through self-government rather than by legislation.
(3) Safeguard the economic stability of the country by maintaining stability in its own fiscal and international policies
(4) Exercise the greatest economy in public expenditures.
(5) Reduce to a minimum the number of laws affecting business.
(6) Cooperate with foreign nations for the fullest development of international trade.

◆

AND IN CONCLUSION

THESE RECOMMENDATIONS can have value only as they are applied in the planning of individual company operations and in the programs of those industrial, commercial, financial and governmental agencies that are responsible for the conduct of our economic affairs. But taken broadly they constitute a platform of economic principles and business policies upon which far sighted management may well make a stand.

New conditions of our modern industrial civilization have laid new social responsibilities upon those men who guide the destinies of business enterprise. The protection of the welfare of workers and their security of employment and the assurance of permanent income to investors have become basic factors in the attitude of public opinion towards industry. And public opinion in the end has the power to preserve or to curtail that freedom of initiative around which the whole philosophy of American life has been organized.

Business management must meet the call of these responsibilities, therefore, if the people of the world are to be lifted out of the present depression and given assurance of greater stability of earning power in the future. Business leadership itself must strengthen and secure the success of this system of private initiative and cooperative effort upon which the prosperity of this country has been founded and of which it stands today as practically the sole exponent.

This proposed platform is being presented to American business through McGraw-Hill publications reaching into nearly every major industry in the country. It will be developed and interpreted editorially as a guide to the formulation of individual plans and business policies

AS A FURTHER AID in that direction the reader will find within this supplement a check sheet of practical suggestions. Many of them are known to be practised by successful, well managed business concerns. It is believed that they will be of value and assistance to all American business men in planning for future progress and prosperity.

QUIET

To make riding a pleasure—comfortable, swift, smooth, and above all *quiet* — this is today's primary problem for the electric railway industry.

Noise is a public enemy; a menace to human nerve health, and therefore to business as a whole.

Noise-abatement is a leading topic. Commissions are working at it in most large cities.

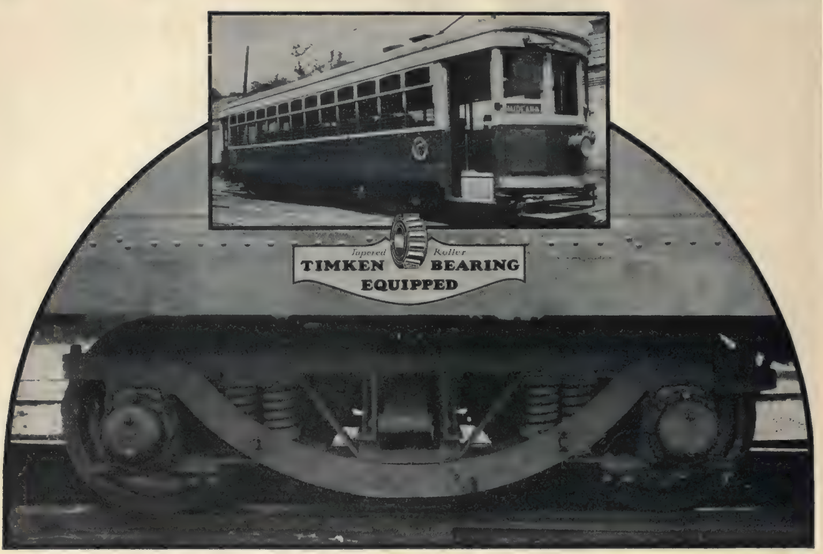
These efforts are bound to get results; and transportation *must* fall in line, must conform to the new and better standards.

In its development of the worm-drive axle for electric railway trucks, The Timken-Detroit Axle Company has made a constructive and immensely valuable contribution to Quiet Transportation and to the entire traction industry.

J R Beachhall

TIMKEN *Worm Drive* **TRUCKS**

FOR ELECTRIC RAILWAY CARS



178,500 Miles on One Set of Wheels

Timken Bearing Equipped car No. 529 was placed in service on The Steubenville, East Liverpool and Beaver Valley Traction Company Lines in June, 1928.

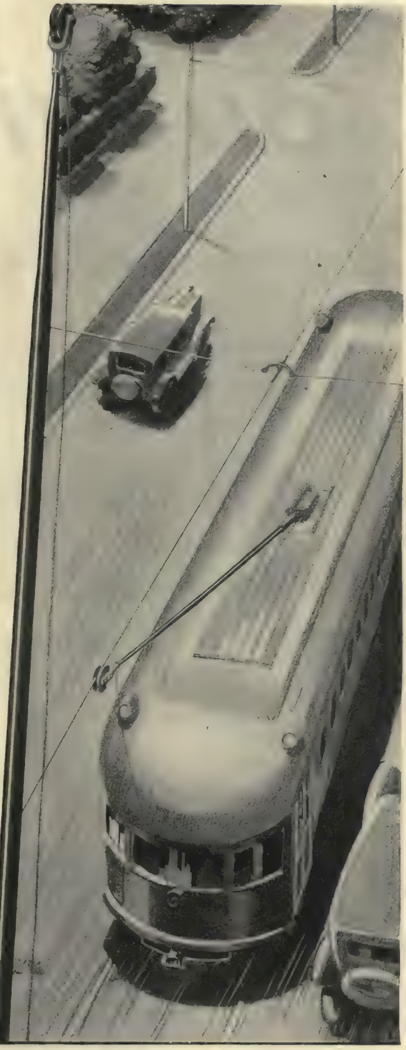
Up to July, 1930, it had gone a total distance of 178,500 miles on the same set of wheels.

Although an outstanding achievement, this is not presented as a record, but rather as an example of the greatly increased mileage that is being obtained from car wheels where Timken Bearings are used.

Writing with regard to the performance of car No. 529, Mr. R. E. Twiggs, Master Mechanic of The Steubenville, East Liverpool and Beaver Valley Traction Company, states: "We have more mileage on wheels and less brake trouble than at any time previous to installing Timken Bearings."

But longer wheel life is only one of the many Timken benefits resulting from Timken tapered construction, Timken-made steel, and Timken precision of manufacture. Timken-equipped cars run smoother and more quietly, start easier, conserve power, save lubricant and send maintenance costs hurtling downwards to knock the bottom out of all former levels. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**



There are also fewer delays with Trolley Poles that are Built to Live Long and Travel Far

REGULARITY and efficiency in electric railway service are measured increasingly, today, by the ability of trolley poles to "stay put"—with few repairs or replacements.

To minimize the possibility of any defective pole being installed, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. Long life and satisfactory service are assured by the use of a selected grade of steel, which is given special heat treatment prior to the last drawing operation.

NATIONAL-SHELBY Poles have a special reinforcement integral with the body of the pole and so placed as to add great strength without excess weight. Write for complete information.

NATIONAL TUBE COMPANY
Subsidiary of United States Steel Corporation
PITTSBURGH, PA.

NATIONAL *SHELBY SEAMLESS* POLES

You will find

.. in the

Model 80 Street Car Coach

Model 81 Parlor Coach

FARGO MOTOR CORPORATION

"6" series of

FARGO COACHES

Fargo "6" Coaches are modern. They are practical. They please riders. They are economical and dependable. They are all that operators seek in coaches of their size. » » Mechanically, they are all that operators want because of 96-horsepower engine . . . 4-speed transmission . . . 10-inch double-drop frame . . . full-floating rear axle . . . 165-inch wheelbase . . . internal hydraulic brakes . . . and many other features. » » The Street Car is equipped with seats of deep spring construction, upholstered in genuine leather. Inside height is 76 inches. Aisle width of 22 inches, with loading well opposite longitudinal seats, assures substantial standee capacity. Door width of 27 inches (in clear) provides for easy entrance and exit. » » Seats in the 16-passenger Parlor Coach are of the chair type, leather upholstered and with detachable seat-back covers. The large clear-vision windows are non-rattling and have a lift of 13 inches. Lights of modernistic design blend with other interior appointments. Rider-appeal is unmistakably provided.

FARGO
BUILT BY CHRYSLER MOTORS

DETROIT, MICH., *Division of Chrysler Corporation*

"MAKE THOSE ENGINES LIGHTER"..

...so they even hollow-drilled the bolts

"ELIMINATE all possible excess weight," was the order received by the engineers of a famous airplane engine manufacturer.

Weight *was* eliminated. They even drilled holes in the barrels of the bolts to make them lighter, reaching the minimum weight compatible with the necessary strength.

These hollow-drilled bolts, excellent examples of engineering skill, made the famous engine lighter and thus contributed to greater efficiency. They were strong and they were light; made of a high-grade, special alloy steel. They were a distinct credit to the intelligence and craftsmanship of eminent airplane engine designers and machinists.

Cost was not a primary consideration. These bolts were expensive because of the high cost of drilling the hole vertically through the head and barrel of each bolt. The work was done slowly, carefully, in the engine company's own machine shop.

The bolts cost 64 cents apiece, and eleven of them were used to bolt every engine together.

ONE day, an R B & W salesman called at the airplane engine factory. He believed he might be able to save the company money on engine bolts, and took one of the 64-cent bolts to the R B & W Engineering Service Department.

After a consideration of the problem, the salesman was able to sell the engine makers a standard R B & W Bolt, without the expensive drilled hole, which possessed these outstanding advantages:

1. It weighed only half as much as the former drilled-barrel bolt.
2. It possessed greater strength than the drilled-barrel bolt.
3. It cost 4 cents, instead of 64 cents, a not unwelcome saving.

Since 1845 R B & W has been amassing specialized knowledge of bolt and nut usage and requirements in all branches of industry. If you have a bolt or nut problem, or think there is a possibility of improving your present practices, we probably have the answer already worked out for a similar problem elsewhere.

Executives, engineers, shop men and purchasing agents are invited to write us about their bolt and nut requirements. No obligation.

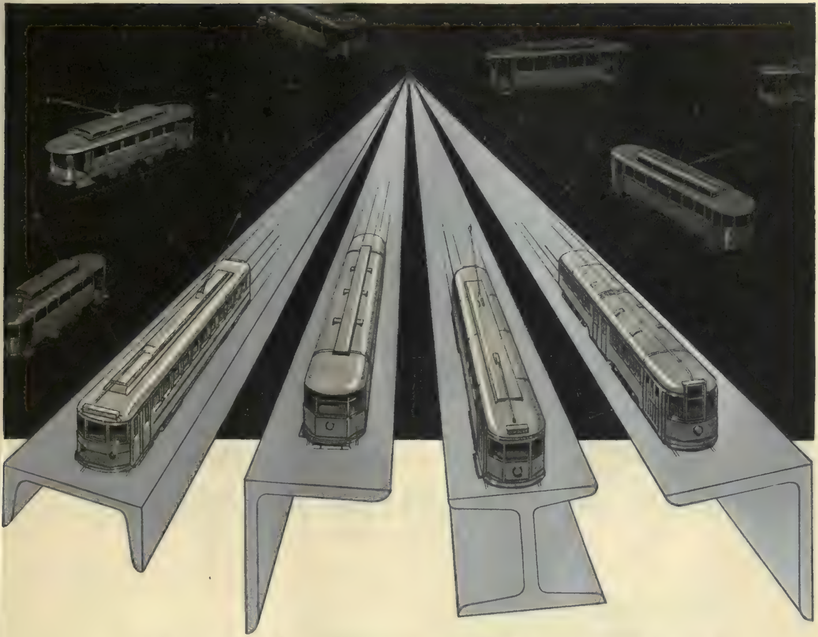
RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

SALES OFFICES AT

Philadelphia Detroit Chicago San Francisco Los Angeles Seattle Portland, Ore.

R B & W EMPIRE BOLTS & NUTS



Out of the Web of Dead-weight
—thanks to the strong alloys of Alcoa Aluminum

Modern transportation can no longer wait for dead-weight. It need not. For, shattering old traditions, come structural shapes in sizes up to 10 inches in depth and 90 feet in length, made of the strong alloys of Alcoa Aluminum; strength for strength, the equivalent of structural steel but weighing only 1/3 as much.

News! It is more than that. It is a new epoch in the making.

Apply this new type of construction to street railways and subways and this is what happens. Relieved of many tons of surplus dead-weight, street cars compete more easily with traffic conditions.

Weight reductions run into figures like these: 3,325 lbs. of Alcoa Aluminum used, 7,863 lbs. of dead-weight saved; 2,300 lbs. of Alcoa Aluminum used, 2,500 lbs. of dead-weight saved. Savings run as high as 33.6% of the total weights of cars.

With dead-weight saved, cars with the same motive power get away to smoother starts and make quicker, easier stops and faster schedules. As an alternate, schedules can be maintained with reduced motive power.

Standard structural shapes of the strong alloys of Alcoa Aluminum from which street cars and railway coaches are made, are carried in stock. Plates, rivets, bolts and screws are also available.

The engineering handbook, "Structural Aluminum," is available at $1.00 a copy. Address ALUMINUM COMPANY *of* AMERICA; 2463 Oliver Building, PITTSBURGH, PENNSYLVANIA.

ALCOA ALUMINUM

The SAFETY CAR ▲ ▲ ▲
CONTROL EQUIPMENT

▲ ▲ ▲ now provides
additional safety ▲ ▲ ▲

THE "Self-Lapping" Brake Valve, now available for Safety Car Control equipments, adds a new element of safety—it permits the desired cylinder pressure to be obtained more readily, and assures that the fast application and release, provided by the Relay Valve, can be properly controlled so as to realize the maximum benefits.

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH

No pounding

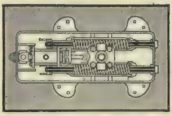
with the force of a 100 pound sledge when—

the 3-in-1 switch stand is used

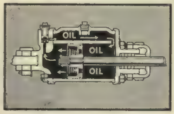
IT'S a fact . . . the Racor 3-in-1 Switch Stand eliminates that terrific pounding which wears and breaks stands, points and wheels by the thousands every year. This elimination of pounding is accomplished by combining in a single unit an automatic double coil spring returning points after trailing train has passed, an oil buffer preventing return of points between successive pairs of wheels, and a rigid throw always ready for hand operation.

It provides a continuous right of way in both directions. A rigidly connected target always shows the exact position of the switch points. With the 3-in-1 there is no necessity to stop cars to operate the switch or the expense of control from a distant tower.

This switch stand is saving thousands of dollars at every location it is used . . . Write today for complete printed information about the 3-in-1.



The automatic double-coil spring returning points after trailing car has passed.



The adjustable oil buffer preventing return between successive pairs of wheels.

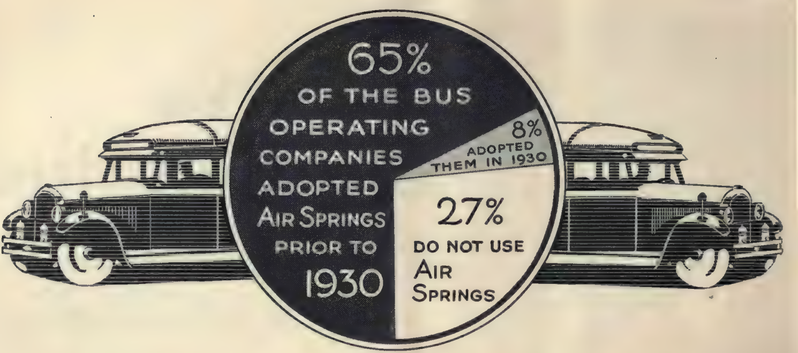
• • •

The rigid-throw always ready for hand operation. Parts simple and readily accessible for oiling and inspection.

RACOR
TRADE MARK

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . Los Angeles—Seattle
Canadian Ramapo Iron Works, Limited . . . Niagara Falls, Ontario
General Offices—230 Park Avenue, New York
Sales Offices at Works, and McCormick Bldg., Chicago—Midland Bank Bldg., Cleveland, Ohio
Metropolitan Bank Building, Washington Builders Exchange Building, St. Paul
Nine Racor Works: **Hillburn, N. Y., Niagara Falls, N. Y., Chicago, Ill., East St. Louis, Ill., Superior, Wis., Pueblo, Col., Los Angeles, Cal., Seattle, Wash., Niagara Falls, Ont.**



From 65% to 73% in 1930

During the year 1930, the percentage of bus operators using Air Springs increased from 65 to 73% or a net gain of 8%. These super shock-eliminators are such an integral part of efficient bus operation that we confidently feel that a corresponding gain will be made in 1931.

If your company is one of the 27% not using Air Springs, we would appreciate an opportunity of laying before you evidence of the value of the pneumatic principle of absorbing shock.

Air Springs cost less than a set of tires and quickly pay their way in maintenance, cost reduction and passenger comfort. They absorb shock and reduce vibration, thus protecting the body, chassis and steel springs from destructive impact.

Air Springs are manufactured by The Cleveland Pneumatic Tool Company, Cleveland, Ohio, and serviced the world over. Export Department, 40 Rector St., New York City.

CLECO AUTOMOTIVE PRODUCTS

MANUFACTURED BY THE CLEVELAND PNEUMATIC TOOL CO., CLEVELAND, OHIO

650,000
SAFE . . . *quick* . . . *quiet*
STOPS

STOPS at high speed—stops at low speed—stops with the brakes hot—stops with them cold—25,000 miles of stops through the congested traffic of a busy eastern city. And this set of Johns-Manville Brake Blocks is still in good condition, ready for thousands of miles more of cost-free operation.

Test a set of J-M Brake Blocks on the toughest route your buses travel. Notice the high speeds, the smoother, quicker stopping, the safer braking they permit. Watch how they reduce upkeep costs. Check up on the thousands of miles additional service they give you—notice how shop lay-ups for adjustments are reduced—how road delays are eliminated. J-M Brake Blocks increase tire life. They spare the brake drums, cut the risk of accidents and lessen the fatigue of drivers.

J-M Brake Blocks have been designed to stand up under high speed, heavy duty operation—and they do. Made of asbestos, of uniform structure throughout, their gripping power remains positive and constant at all stages of wear. Every fleet owner concerned with keeping costs down should investigate this modern tested friction material. *Address:* Johns-Manville, New York, St. Louis, San Francisco, Cleveland, Chicago, Philadelphia, Montreal.

Johns-Manville SERVICE TO BUS TRANSPORTATION

JOHNS-MANVILLE JM PRODUCTS

Bus & Car Insulation · Asbestos Exhaust Pipe Covering · Packings · Masticoke & Truss Plate Flooring · Tile Flooring · Friction Tape · Brake Blocks & Linings

7 YEARS OF THERMIT I

The East Bay Street Railway, Ltd., formerly the Key System Transit Co., first tried Thermit welding in May, 1924. Since then this process has become the standard practice of this Company. The photographs show track welded in 1926. This is another of the growing list of satisfied Thermit users featured in these pages.

1098 cars per day pass this location . . . Broadway, 15th to 26th Sts. . . . Thermit welded, July 1926.

The METAL & THERMIT CORPORATION

120 Broadway, New York, N. Y.

Pittsburgh Chicago Albany So. San Francisco Toronto

OAKLAND, CALIFORNIA

Approximately 12,000 Thermit rail-welds have been installed during the seven years since the first trial installation. This is equivalent to about 60 miles of track,—mostly laid with 122 lb. A.E.R.E.A. and 70 lb. A.S.C.E. rail sections. There are also some Thermit-welded 9-in. sections with 134 lb. and 141 lb. rail.

1128 cars per day pass this location . . . Thirteenth St., Washington to Webster . . . Thermit welded in 1926.

The
METAL & THERMIT
CORPORATION

120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So. San Francisco Toronto

ILLINOIS

SPIKES &

TRACK

BOLTS

stand the

punishment of modern high-speed service

US STEEL

Illinois Steel Company

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street :: Chicago, Illinois

Because advertising works to improve business it deserves the whole hearted endorsement of every business man.

While it is working to improve business, it is working to increase traffic.

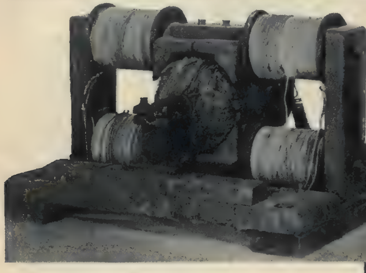
Collier Service Advertising not only works to improve business and to build traffic, but also, it is a reliable source of income to the operating companies.

Barron G. Collier Inc.

CANDLER BLDG. NEW YORK CITY

Car Card Advertising Almost Everywhere

NATIONAL PYRAMID BRUSHES **STANDARD FOR 40 YEARS**



Experimental, two-phase alternating current dynamo, built in 1878 by Elihu Thomson.

Modern, hydro-electric plant with seven, 40,000 KV-A water-wheel driven generators.

Progress that Never Ceases

SOUND fundamentals compose the foundation of progress. The experimental, two-phase, alternating current dynamo, built in 1878 by Elihu Thomson, looks crude but it gave material form to certain basic principles originating in the mind of a great pioneer in electrical engineering.

The first carbon brush was also crude. But it demonstrated the superiority of carbon as a brush material and National Carbon Brushes were soon playing an important part in engineering development.

Rapid progress, based on principles embodied in this early dynamo, has continued year by year. Many improvements and refinements have been introduced. Today we have huge generating stations erected throughout the country to serve the needs of our cities and our varied industrial activities. The 280,000 KV-A hydro-electric plant, shown on this page, is typical of modern development. This accomplishment was made possible by the originality, initiative, courage and hard work of the pioneers in electrical engineering and of those who have followed in their footsteps.

Each new development has placed heavier demands on the brushes. The contrast between the National Pyramid Brush of today and the carbon brush of the 80's is as striking as the development of the alternating current generator illustrated above. The end is not in sight. Progress never ceases. Constant research and steady improvement in manufacturing processes give assurance of National Pyramid Brushes adapted to the requirements of any development the future may hold in store.

CARBON

Flint-hard particles of carbon, supported between highly polished carbon discs, transform the vibrations of your voice into a pulsating electric current and enable you to talk with your friend thousands of miles away. Just one of the many problems carbon has solved. It may solve yours. Let our engineers advise you.

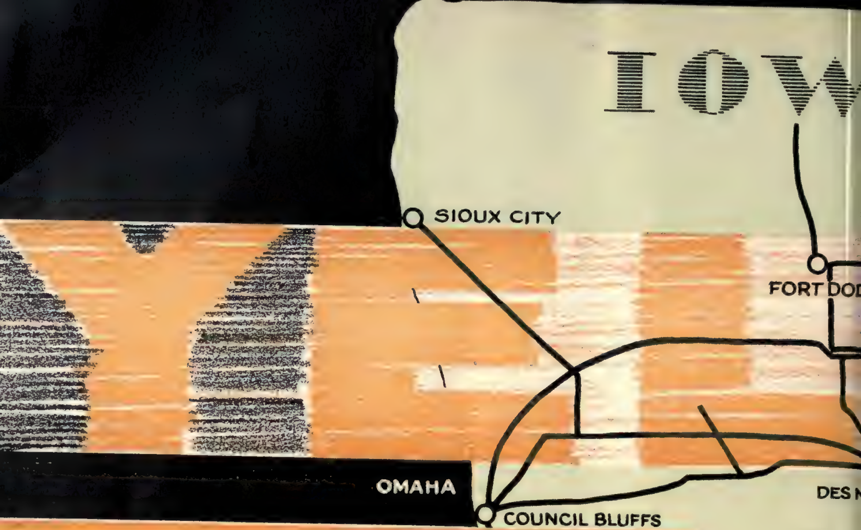
NATIONAL CARBON COMPANY INC.

Carbon Sales Division · Cleveland, Ohio
Unit of Union Carbide and Carbon Corporation

BRANCH SALES OFFICES: NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO

In Iowa . .

1/3 of all the buses are *Yellows*



ORE YELLOW COACHES THAN ANY OTHER

MORE YELLOW COACH CITY OPERATIONS

OUT WHERE THE tall corn grows, Yellow Coaches predominate. Yellow corn and Yellow Coaches distinguish Iowa.

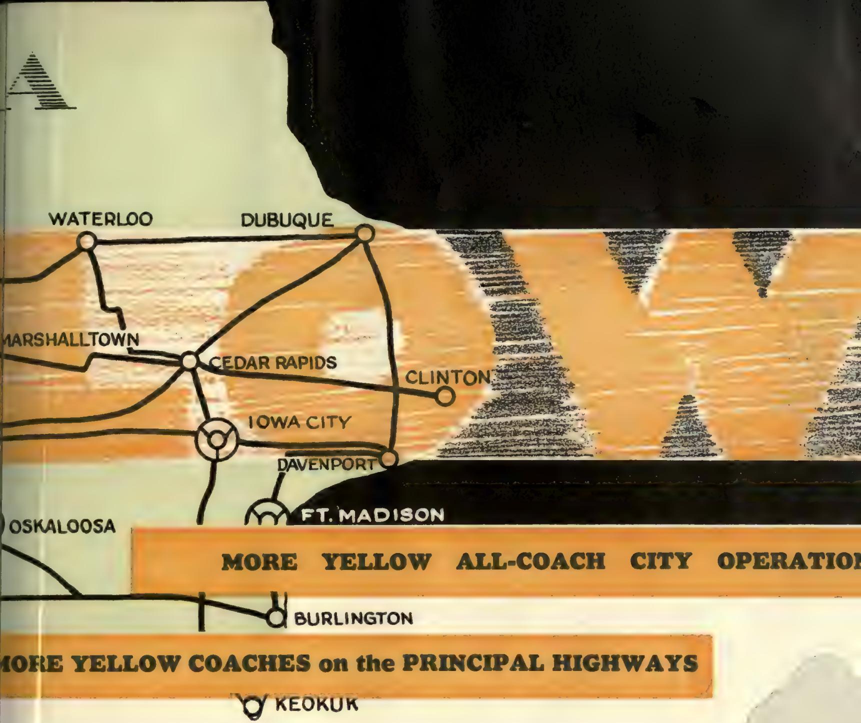
The first Yellow Coach started operation in Iowa on June 6, 1926 – less than five years ago. On January 1, 1931, there were 101 Yellow Coaches operating in the state.

Ft. Madison, Iowa

n 1805 a famous military post that layed a conspicuous part in early merican history. By 1893 a proserous community with an electric treet car system. Now, county eat of Lee County . . . trading enter for a typically progressive arming territory . . . population 3,778 . . . *and another all-coach ty.*

Oskaloosa, Iowa

Population 10,120 . . . in Mahaska County, where once the Indians hunted buffalo . . . now rich farm country where Corn is King. In this modern urban-rural community Yellow Coaches now serve where once an electric railway contributed to the development of the community. *Another all-coach city.*



Many of the principal cities in Iowa are now served exclusively with Yellow Coaches, and Yellow Coaches are being operated on over 3,000 miles of bus routes in this famous state.

Over one-third of all the common carrier motor coaches in Iowa are Yellow Coaches.

Iowa City, Iowa

Population 15,342. Once the capital of the State . . . now a university city . . . the great educational center of Iowa and a busy industrial community. When revenues from street car service became inadequate the operating company substituted Yellow Coaches. Result, more efficient service with less equipment, better earnings, fewer accidents, improved traffic conditions and satisfied riders. *Another all-coach city.*

Marshalltown, Iowa

Population 17,367. Once a settle ment on the Overland Trail. Ther came the railroad. The settlemen became a town. Electric cars ultimately replaced the horse cars . . but the city kept growing, out reaching the zone of street ca service . . . the automobile cam . . . revenues dropped . . . then cam Yellow Coaches, replacing th street cars . . . serving a greate area with less equipment, handlin more passengers with fewer acci dents, faster schedules, bette earnings. *Another all-coach city.*

Yellows on the highway

Fort Dodge, Des Moines & Southern

▲

Crandic Stages

▲

Interstate Transit Co.

▲

Greyhound Lines

▲

Burlington Transportation Co.

▲

Clinton, Davenport & Muscatine Ry.

▲

Waterloo, Cedar Falls & Northern Ry.

▲

Central Transportation Co.

▼

operate 73 Yellow Coaches *over 3250 route miles*

YELLOW COACH

General Motors Truck Co., Pontiac, Mich.

Subsidiary of Yellow Truck & Coach Mfg. Co.

Electric Motor Insulations

...for every need

for every motor type and size!

Glance at the insulations listed at the right. There is one for every motor need from slot buttons to phase leads. They are all performance-proved in thousands of motors of every manufacture. Their quality is unvarying, for throughout manufacture—from raw materials to finished products—continuous inspections to most rigid standards are maintained.

We offer you one source of supply for all your motor insulations and quality that is unexcelled.

MICA INSULATOR COMPANY
New York: 200 Varick Street Chicago: 542 South Dearborn Street
Works: Schenectady, N.Y. London, England
Cleveland Pittsburgh Cincinnati Birmingham Seattle San Francisco Los Angeles Toronto Montreal

Super-Micanite and Micanite

Commutator Segments Commutator Rings, Tape.

Empire Oiled Insulations

Linotape, Cloth, Armatite, Paper, Tubing, Canvas Duck, Silk.

Mica Insulations

Varnishes, Compounds, Slot Paper, Cotton, Sleeving, Friction Tape, Rubber Tape, Twines.

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

For low cost per mile
For trouble-free service
For Safety

It is significant that Bethlehem Wrought Steel Wheels are so widely used on electric railways. Significant, because there is no more severe service demanded of wheels than that resulting from today's higher speeds, and the much quicker starting and stopping of cars. Only wheels of high character can stand up under the extremely heavy traffic of modern cities and their suburbs.

Bethlehem Wrought Steel Wheels have strength, endurance and wearing qualities worked into them during the process of manufacture. Five distinct forging and rolling operations are required to make a Bethlehem Wheel. The forging gives the metal density and toughness. The rolling establishes a refinement of grain structure, with a corresponding increase in strength and ductility. Each wheel is carefully inspected at every step, throughout the process of manufacture.

If you investigate these wheels you will learn, as so many other electric railway executives have learned: that for trouble-free service, for safety, for low cost-per-mile, Bethlehem Wrought Steel Wheels are unsurpassed.

BETHLEHEM STEEL COMPANY, General Offices: BETHLEHEM, PA.

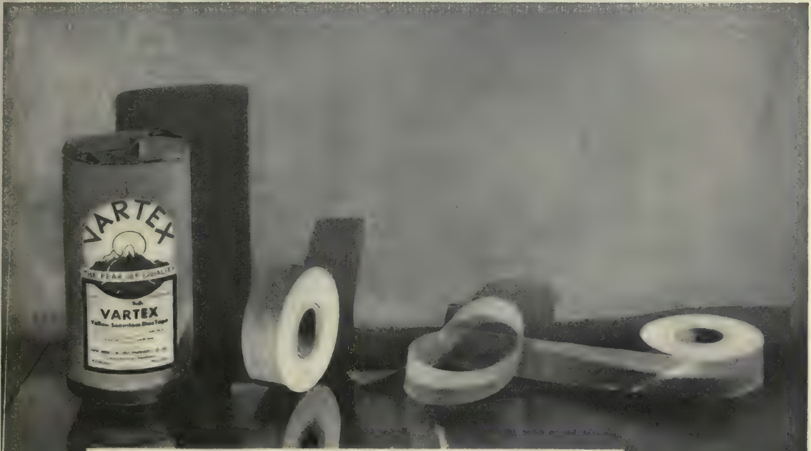
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis.

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu.

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City.

BETHLEHEM
Wrought Steel Wheels

VARTEX—*a seamless bias tape*



The Vartex Factory at
Woodbridge, N. J.

VARTEX bias-cut tapes are made without seams. Therefore, Vartex Wrappings are smooth, free from lumpiness and have the same high dielectric at all points—

Specify Vartex Products when ordering material for rewinding field and armature coils.

NEW JERSEY WOOD FINISHING COMPANY, Inc.
FOUNDED 1907
ELECTRICAL INSULATION DEPARTMENT
Woodbridge New Jersey

THE car that is laid up for repairs is like a man out of work. It is performing no service and returning no revenue. It means buying more cars to be held in reserve and used for replacements to maintain a full schedule. You can minimize the need for repairs because of axle wheel or armature shaft failure by having these vital parts made of "Standard" Steel.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES AND WORKS; BURNHAM, PA.

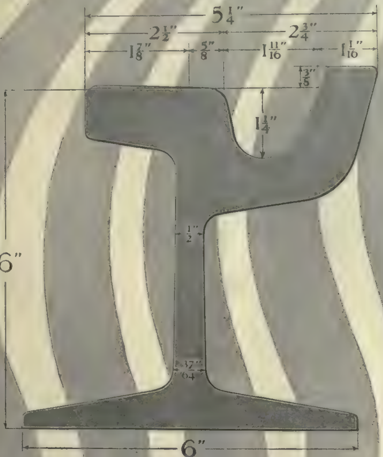
CHICAGO
NEW YORK
AKRON

SAN FRANCISCO
PORTLAND

RICHMOND
ST. LOUIS
PHILADELPHIA

Consider it for Curves

Girder Guard
Section 122 No. 539



This rail was first suggested and subsequently designed principally for use in connection with 6-inch tee rail track on curves. It has evident advantages as an alternative for tee rail guard with necessary appendages including separators, joint chocks, etc. It is also often used instead of rolled shaped guard with its appendages. Neither the tee rail guard nor the rolled shaped guard has proven as satisfactory under certain traffic conditions, as our Section 122 No. 539.

The use of this girder guard section is not confined entirely to curves, as it is equally desirable with tee rail turnouts, branch-offs, etc., which require guarding on the inside rail or opposite frogs. We recommend your consideration of this rail for these specific uses.

Weight: 122 pounds per yard

THE LORAIN STEEL COMPANY, Johnstown, Pa.

Subsidiary of United States Steel Corporation

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

merican Bridge Company
merican Sheet and Tin Plate Company
merican Steel and Wire Company
arnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

acific Coast Distributors — Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors* — United States Steel Products Company, 30 Church Street, New York, N. Y.

ORAIN SALES OFFICES— Atlanta Chicago Cleveland Dallas New York Philadelphia Pittsburgh

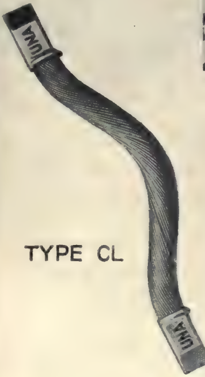
UNA BONDS
ALWAYS DEPENDABLE

MANY of the leading Railway Systems specify UNA Bonds because experience has proved that the American Steel & Wire Company is an unfailing source of supply for unvarying Bond Quality, and because UNA Bonds *insure* dependable service at low cost.

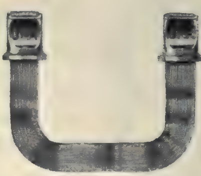
Easy to weld—the molten metal alloys itself with the steel—a UNA Bonded rail will pass the standard drop test. By using our Duron Welding Wire, a solid homogeneous union of great strength results. Our engineers are at your service regarding special applications.

TYPE MCUA

TYPE CUA



TYPE CL



TYPE LUA

TYPE CBA

1831 COMMEMORATING AMERICAN STEEL & WIRE COMPANY 100 YEARS of PROGRESS IN WIRE MAKING 1931

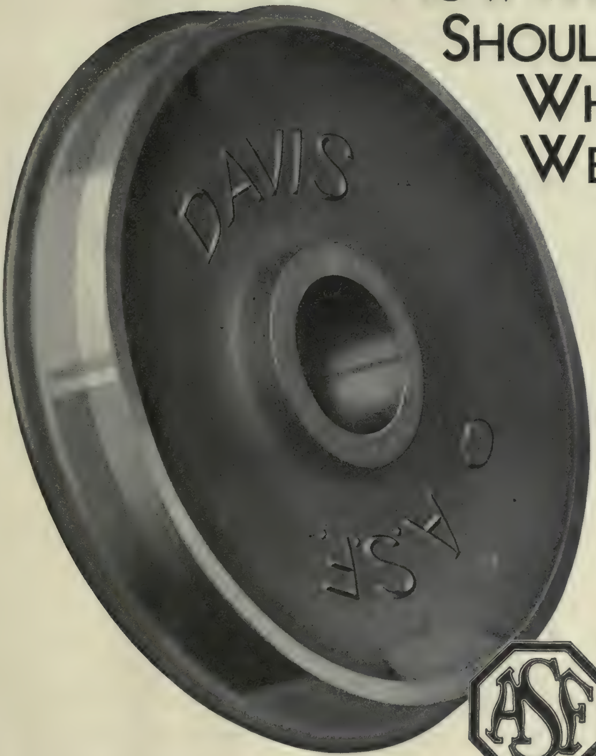
AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION **And All Principal Cities**

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

HOW MUCH SHOULD A WHEEL WEIGH

?



ENOUGH metal must be put in a car wheel to give adequate strength and wear resistance. How much of it is necessary to fulfill these conditions depends upon the kind of metal used. By reason of its special heat-treated composition the Davis "One-Wear" Steel Wheel can secure a given result with a minimum weight. It's the special metal that makes the difference.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

Better performance + *greater economy* *with* SOCONY BANNER GASOLINE

THE twenty-six modern buses of the Western New York Motor Lines, Incorporated, operate on an hourly schedule between Buffalo and Rochester. This same company also owns a fleet of trucks for freight deliveries in this territory.

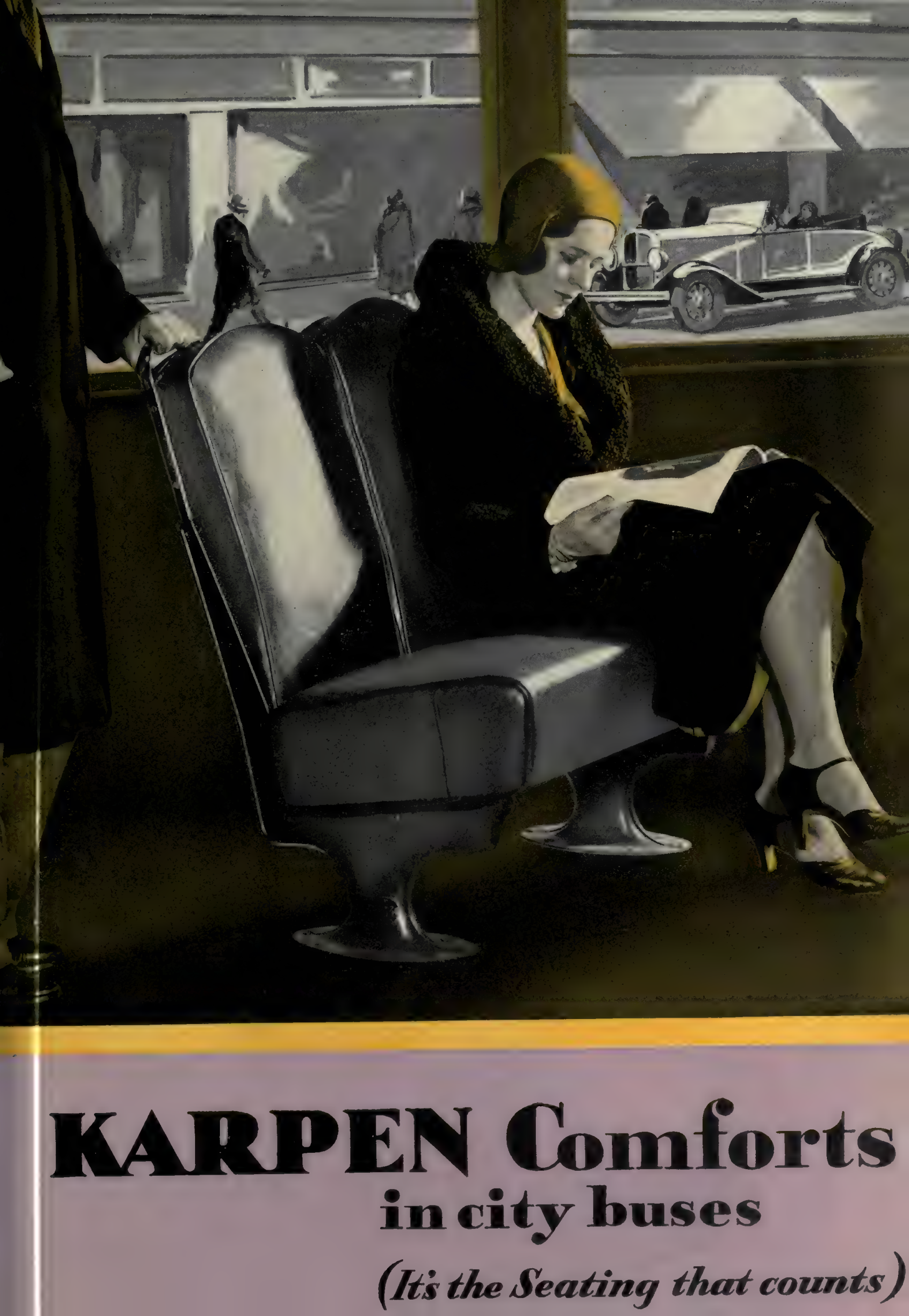
Socony Banner Gasoline is the fuel used exclusively by the "Blue Bus Line." It was chosen because it gives better performance than any other non-premium gasoline, and because of its economy in that it burns clean with the minimum of carbon formation and dilution.

You, too, may effect economies and increase performance by using Socony Banner Gasoline in your motor fleet.

SOCONY

BANNER GASOLINE **SPECIAL GASOLINE *plus* ETHYL**
MOTOR OIL **NEW SOCONY MOTOR OIL**

STANDARD OIL COMPANY OF NEW YORK


KARPEN Comforts
in city buses
(It's the Seating that counts)

KARPEN
FURNITURE

CITY SERVICE SEATS

KARPEN City Service Seats are recognized and accepted by transportation men everywhere for their comfort, beauty and durability.

Karpen's Safe-T-Grip offers operators a desirable and additional feature for city operation.

Millions of miles of transportation seat building experience have bred into Karpen bus, electric car and trolley coach seats those qualities which attract passengers and reduce seat-mile costs. For fifty years Karpen has been a leader in furniture seat building, too.

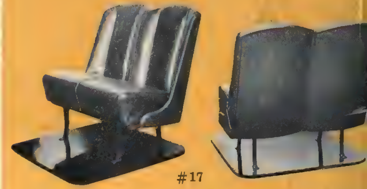
S. KARPEN & BROS.

Transportation Seating Dept. Chicago

New York Michigan City, Ind. Los Angeles

SafeTGrip

#108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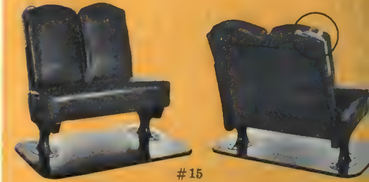
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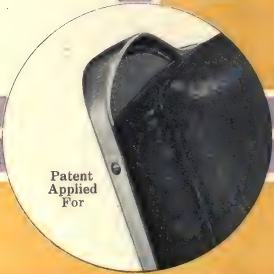
Patent Applied For

KARPEN

It's the Seating that counts—

CAREY Elastite Rail Filler installed in these tracks over four years when photographed.

Carey Elastite

RAIL FILLER

Cuts Track Maintenance Expense

The problem of maintaining paving next to tracks in good condition is simplified when CAREY Elastite Rail Filler is installed. The fibrous asphalt compound resists moisture, and does not soften or grow brittle as the result of temperature changes. The rail vibration is largely absorbed instead of being transmitted to the adjacent paving, and thus paving "kick-ups" are greatly lessened. Finally, track noises are muffled.

Elastite Rail Filler is proving its value all over the country in urban trackage. The cost is moderate and it is quickly installed, being premoulded to fit any rail.

Write for full information and prices, specifying rail weight and number.

THE PHILIP CAREY COMPANY ✣ Lockland, Cincinnati, Ohio
Branches in Principal Cities

BUILT-UP ROOFS
ASPHALT PRODUCTS
ELASTITE EXPANSION JOINT
WATERPROOFINGS
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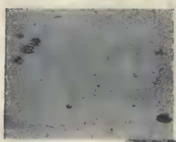
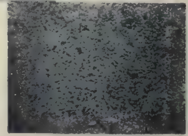
DULUX (*below*)
19 months' exposure



To insure quicker and more accurate tests these panels were exposed under conditions that reduced the life of each finish to probably 33% of its normal span. Dulux shows 175% greater durability.



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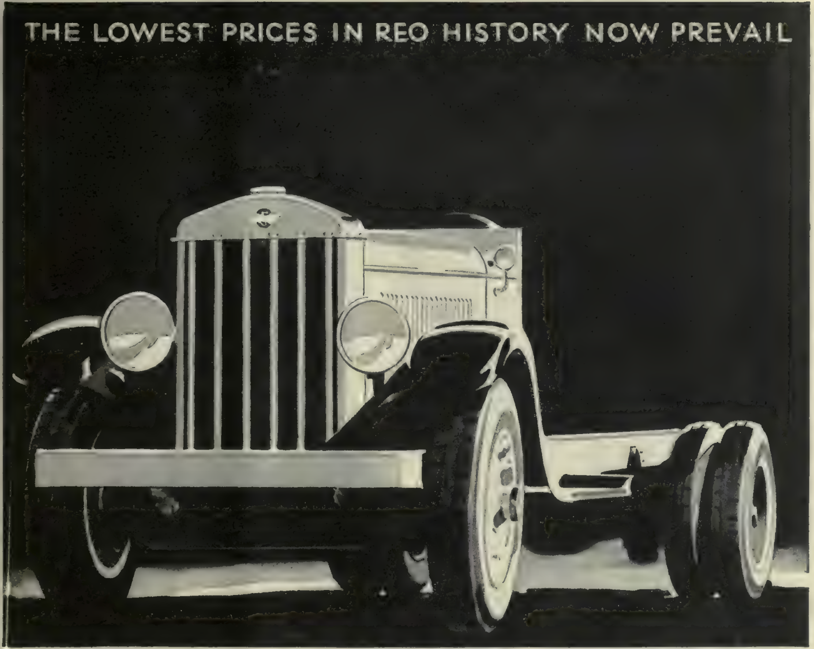

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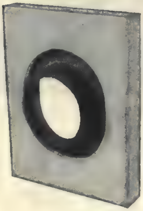

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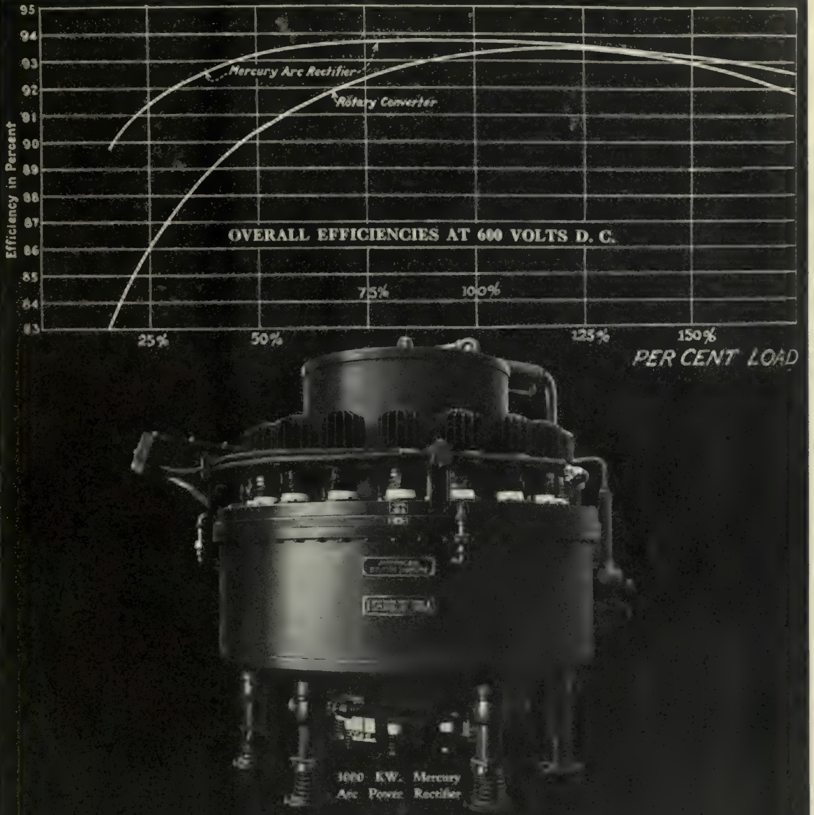

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ABB

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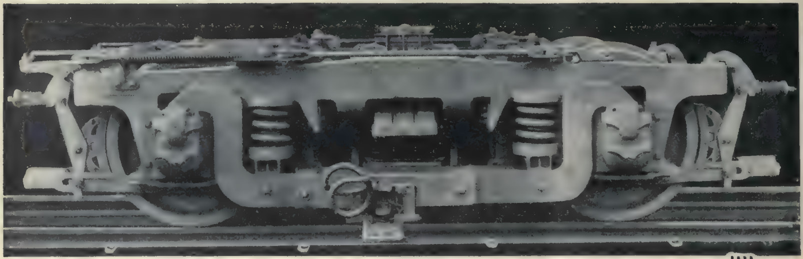

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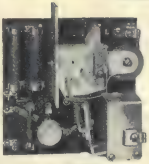

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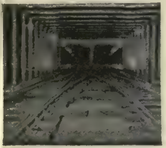

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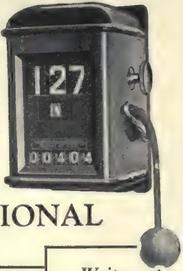

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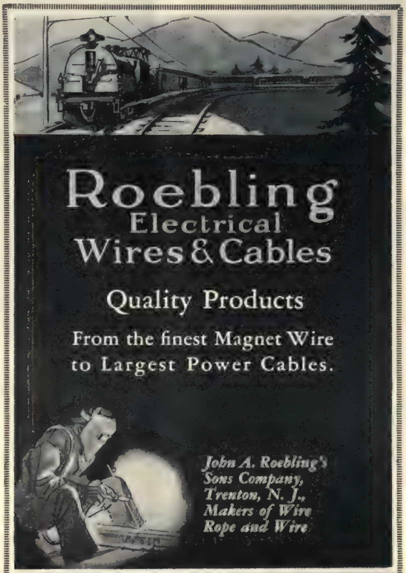

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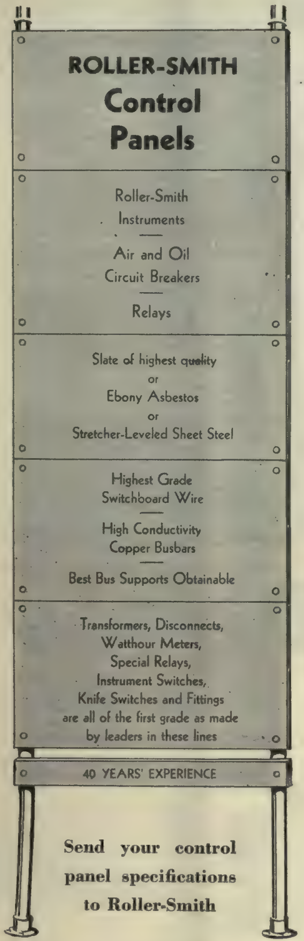

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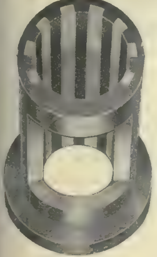

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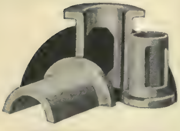

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1931 Maintenance—Poles, Etc.

Many tubular steel poles, normal maintenance of which was deferred from 1930 as not being immediately necessary, should now be brought back to original strength for many more years with M. I. F. Reinforcing and Extension Clamps.

Typical M.I.F. Reinforcing and Extension Clamps

Their cost, installed, is less than for comparable results by other methods, whether used for corrosion at ground-line or at upper joints.

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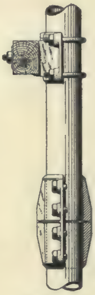
Use Williams Pole Mounts for the special job of mounting poles, tubular steel or wood, on rock, concrete, bridges, etc.


"C" Clamp Extension and Gain Assembly.

Sales Bulletin No. 3 covers the above. Send for it.

Insulated Suspension Hangers for signal conductors, etc., as illustrated above, merit your consideration also—as well as our popular Guy Hooks and accessories, Crossarm Gains for wood and tubular poles, Aerial Cable Suspension Clamps, Catenary Clamps, H-Column Mounts, etc.

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P.M.
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000602
Detroit Motorbus Company
Good for continuous passage only if presented on date issued and before latest time shown at established transfer point
JOHN R. No. 8
INBOUND
Gerald to East City Limits
00602
EMERGENCY
45
0
15
30
45
9 p.m.
10 p.m.
11 p.m.
12 midnight
NOTCH PERFORATION

May we show you...

Why more than 90 electric railway companies have recently modernized their fare systems by changing over to one or more of the several types of Globe (no-punch) Transfers? Reports of results from many of these companies make interesting reading. They tell of revenue increases, reduction of fare abuse, faster schedules, speedier collecting, etc.

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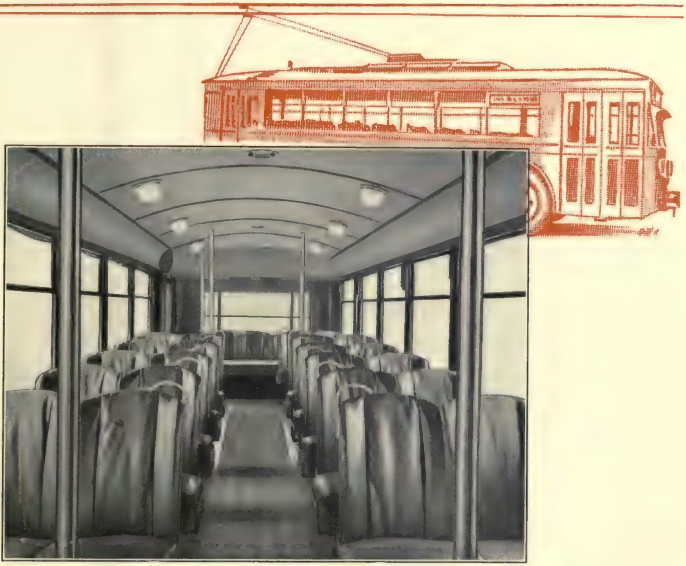

The business side of the trolley bus—

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Take a ride in a Brill Trolley Bus in Chicago or Rockford if you would best appreciate the excellent riding qualities of this modern type of transportation vehicle. Coordination of both body and equipment to give a practical 60-40 load distribution is largely responsible for the smooth and comfortable riding action. Win public patronage with Brill Trolley Buses.

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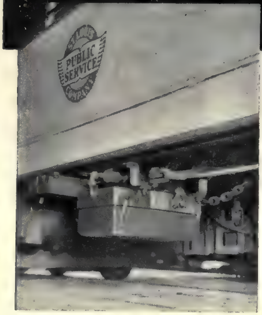
Brill Trolley Buses

FOR HIGHER SCHEDULE SPEEDS

STUDY THE POSSIBILITIES OF FIELD-SHUNTING EQUIPMENT



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THE excellent results obtained with G-E field-shunting equipment indicate that on many routes higher schedule speeds can be achieved economically without change of gear ratios. This equipment consists of an automatic field-shunting switch and a newly developed inductive shunt, and it can easily be adapted to almost any type of control apparatus now in use.

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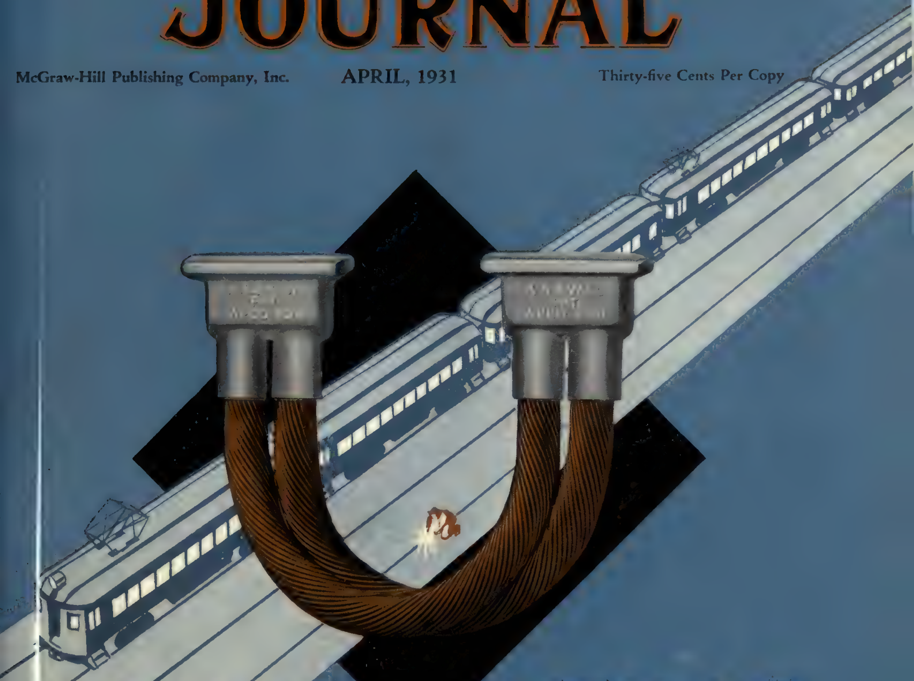
ELECTRIC RAILWAY JOURNAL

McGraw-Hill Publishing Company, Inc. APRIL, 1931 Thirty-five Cents Per Copy



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ELECTRIC RAILWAY JOURNAL

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., Editor

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1931

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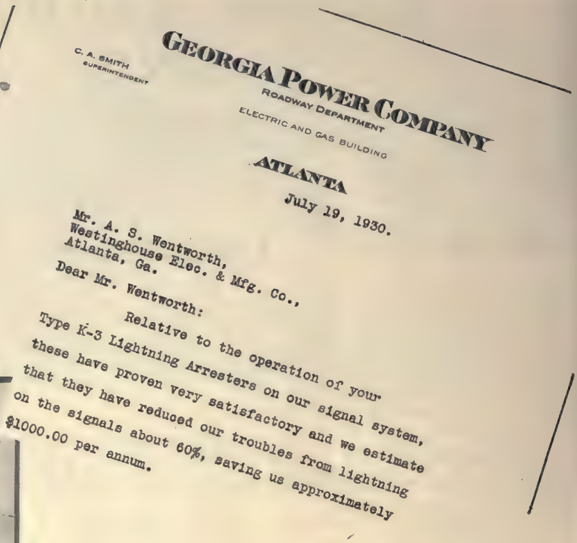

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ELECTRIC AND GAS BUILDING
ATLANTA

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WESTINGHOUSE TRACTION BRAKE COMPANY
General Office and Works » » » Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES

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Note double slide reversible feature

—and every car is equipped with

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Reversible

TROLLEY SHOE

¶ This marvelous record on a property operating 41,816,256 car miles per year is not mere accident. ¶ Detroit has seriously studied and analyzed its overhead problems. ¶ The adoption of IONLOYD Reversible Trolley Shoes followed more than a year of most exacting test work. ¶ Some of the proven advantages are remarkable lack of overhead damage—reduction of trolley noises—elimination of radio interference—low cost per mile of trolley contact.

Let us show results on your property.

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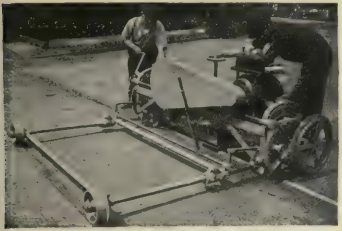
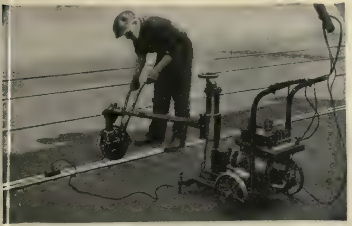
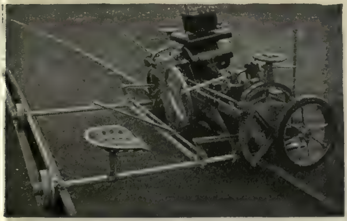
Ajax Electric Arc Welder



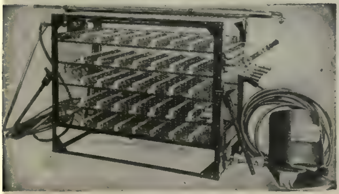
Vulcan Rail Grinder



Eureka Radial Rail Grinder



Improved Atlas Rail Grinder



Ajax Electric Arc Welder

The price of survival

WHETHER any given electric railway property can or cannot survive depends on just so many vital factors.

Certainly one of them is maintenance of way.

Whatever else a road may do, it cannot survive if the track deteriorates so that bumpy rail drives away riders, racks the rolling stock and damages the track structure.

Arc Welding and grinding the joints, grinding out corrugations preserves traffic, cars and track. The cost of such maintenance is surprisingly low if you use the modern equipment and supplies we offer.

Railway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

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Chas. N. Wood Co., Boston
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F. F. Bodler, San Francisco, Cal.
H. E. Burns Co., Pittsburgh, Pa.
Equipment & Engineering Co., London

When Rail Joint Los
Amounts to 18 Cent

IT HAS been reliably estimated that the normal power loss
an efficiently bonded rail joint amounts to approximately
cents per year. If deterioration should cause the bond to l
some of its efficiency so that its resistance equals 6.4 feet of
lb. rail instead of the normal 3.2 feet, the power loss wo
increase to 26 cents per year, an excess loss of 13 cents. W
an expenditure of 63 cents to $1—which includes the cost
a 7-inch O-B Una Bond, plus the cost of installing—these
cents may be diverted from costs to profits. A rail joint pow
loss amounting to as little as 18 cents yearly would, if correct
provide a saving of 5 cents, which is a six per c
return on the cost of installing a new bond.

The use of O-B Una Bonds permits the maintenan
of a return circuit at a minimum cost. Installatio
which is by the Una Carbon Mold process, insur
strong, ductile, homogeneous welds of high condu
tivity. The deposited metal remains longer in a molt
state and has opportunity to unite most thorough
with the steel rail.

Include O-B Una Bonds among the material you sp
ify for Spring maintenance. You will be pleased, n
only with their quick, simple installation, but a
with their great efficiency and long life. All typ
of O-B Una Bonds are fully described on pages 73
of O-B New Products Supplement No. 4.

O-B Una, Type CL, 11-inch, 4-0 capacity Bonds being installed on the rails of Illinois Terminal R. R. System, St. Louis, with resistance welder, at the rate of 160 per day per crew.

Strong, ductile and homogeneous welds insure good conductivity and high tenacity.

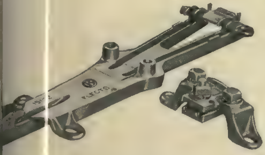
When Safety Says "Yes" and Frugality Says "No"—

wing a Duplex Frog in service on one of St. Louis Public Service Co. lines. Low intenance costs follow the use of such time and labor-saving devices.

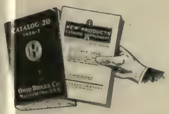
A DECISION to junk a piece of costly overhead equipment is not easily reached when there remains some unused service in it. Still, from the standpoint of economy, it is not always practical to "extract the last drop of blood," even if the device is of relatively high cost. Overhead men recognize this fact but because of the cost, the labor, and the inconvenience of replacing, they sometimes yield to the temptation to let it remain in service when it is a hazard to safe operation.

No such hesitancy is felt, however, where O-B Duplex Trolley Frogs are used. The low cost of the renewable pan, the ease of installing it on the suspension yoke, and the short interruption of schedules make it easy to maintain high efficiency. The overlapping-runner design allows wheels or shoes to collect current and travel from end to end on grooves instead of on flanges, thus adding to life of frog and wheel. The suspension yoke attaches to span and trolley wires where it remains permanently, thus making it unnecessary either to unserve span wires or to use block-and-tackle when renewing pan.

Before replacing frogs during the Spring house-cleaning, think what a saving in labor and time could be effected if it were unnecessary to remove the whole device. You may order a Duplex Frog directly from the information on page 54 of New Products Supplement No. 4. Ohio Brass Company, Mansfield, Ohio; Canadian Ohio Brass Co. Limited, Niagara Falls, Can.



The suspension yoke is permanently fixed. The pan detaches without unserving span or trolley wires.



A copy of O-B New Products Supplement No. 4 will be sent upon request.

1396LB

Ohio Brass Co.

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PORCELAIN INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING MATERIALS
VALVES

ON THE WAY TO LOWER TRACK MAINTENANCE

Here are letters from 26 Track Engineers and Executives who are sure they are on the way to Low Track Maintenance

THEY SAY IN PART

"I consider the vibrating of concrete the greatest step forward in track building in a long time. We have made a number of tests of vibrated concrete as to strength, filling of voids and flow. We have taken out brick paving and concrete after 20 days and found the brick broke before the concrete came loose from the web of the rail."

* * *

"However, after giving the machine a trial of a few hours I found that we were getting the concrete much better placed, and with a great deal less effort. It was also demonstrated that we could use less water in the mix and still get the concrete placed perfectly."

* * *

"The development of this practice in its application to a track which is being concreted . . . is a solution of one of the most troublesome problems with which the street railway engineers have been confronted, i.e., that of sealing the track against the entrance of surface water and of tying the track and concrete together in such a way as to insure their acting more nearly as a unit."

* * *

"Air pockets are removed and a perfect bond is made between concrete and rail, thus preventing water from seeping in between rail and concrete."

* * *

"In no place in the 8500 feet of single track is there the slightest indication that the bond has been broken between the rail and adjacent paving."

* * *

"Concrete can be installed at less cost than with the old method of tamping."

* * *

"The fact that where the vibrator was used caused the contractor to place more material was proof positive to me that the concrete vibrated has less voids than concrete placed without vibration."

* * *

"The vibrator shakes the entire mass and impartially fills all the voids."

* * *

BEFORE YOU BUILD ANY TRACK
SEE THESE LETTERS

CITIES SUCH AS

BUFFALO
WASHINGTON
(Both Companies)
ATLANTA
AKRON
PHILADELPHIA
HARRISBURG
HAVANA
WORCESTER
INDIANAPOLIS
BALTIMORE
YOUNGSTOWN
NORFOLK
ALLENTOWN
WHEELING

Other users not quoted:

DETROIT
BOSTON
CINCINNATI

THE INTERNATIONAL STEEL TIE COMPANY
CLEVELAND, OHIO

Safely

National Pneumatic door control equipment provides the safest, easiest and most convenient method by which passengers may enter and leave cars or buses. It is impossible for the doors to open while the car is in motion . . . it is impossible to proceed until all doors are closed. All possibility of boarding and alighting accidents is eliminated with NP equipment.

NP

Quickly

The time required to take on and discharge passengers is reduced to a minimum by NP door control equipment. Doors are opened instantly by the operator upon coming to a full stop . . . the operator is set to start instantly when the doors close. This saving in time with NP equipment makes possible consistently faster schedules.

The NP Automatic Treadle Exit Door maintains the "Circulating Load" in one-man operation and provides passengers with . . . .

"The Easiest Way Out"

NATIONAL PNEUMATIC COMPANY

From the Car-Pits

From the car-pits on a great many electric railway properties our **Field Research** is constantly securing, in an accurate manner, **Positive Data** on **Wheel Wear.**

NACO SPU

WE SOLIC

MEMBER AMERICAN ELECTRIC RAILWAY ASSOCIATION AERA

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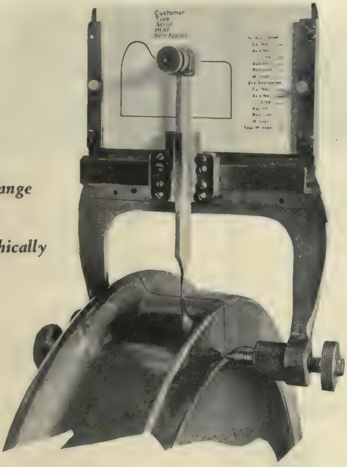
CLEVELAN

Steel Plants: SHARON, PA., CHICAG

THE CAR-PITS on your own properties, through the practice we have established for following the service of wheels, become a **Laboratory** for getting **Facts** on car wheel life.

Information we secure in the manner as pictured is collaborated with the work constantly carried on in our own extensive research laboratories.

Tread and Flange
Contours
Recorded Graphically



A practice which will
enable
every operator
to develop comprehensive
facts relating to life
and service of their
car wheels

NACO SPUN STEEL wheels in use under varying operating conditions have already indicated conclusively to a great many operators the **"Rewards of Economy"** that result when development and manufacture are continually based on getting the **True Picture in Service.**

TEEL WHEELS

JR INQUIRIES

EEL CASTINGS COMPANY
O, U. S. A.

MELROSE, PARK, ILL.

MEMBER
AMERICAN ELECTRIC RAILWAY ASSOCIATION
AERA

UP-TO-DATE SERVICE
REQUIRES MOD

Golden Glow Headlights

Standard Headlights, fitted with the famous Golden Glow mirror glass reflector, project a penetrating, well concentrated beam of light without glaring or dazzling effects.

Flood Headlights, with circular side lens to illuminate dash, make the ideal headlight for city use. Have the regular 9-in. Golden Glow reflector.

Safety Lighting Fixtures

Small Dome Fixtures, generally placed in two rows over the seats, give bright, well-diffused light. Type T fixtures are particularly well adapted for the new twenty-in-series lighting systems; they are light in weight, strong and durable, arranged for easy cleaning and bulb replacements.

Keystone Trolley Catchers and Samson Cordage

This new type catcher has improved universal oiling system, large oil reservoir, greater rope capacity and larger reel. New method of mounting pawls makes catch positive and instantaneous. Samson Spot trolley cord is smooth, pliable, waterproof —it doesn't kink, swell or shrink. Keystone Catcher and Samson Cord make an unbeatable combination.

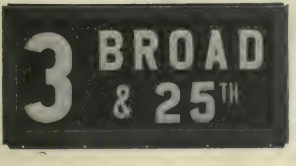
Keystone Rotary Gongs
Keystone Air Sanders

Gongs to make one to fifteen strokes at the will of the operator. A loud, distinct, unmistakable alarm which protects equipment and passengers.

Air Sander Traps are one-piece malleable castings; designed so that sand can't pack; with controlled air they regulate flow of sand.

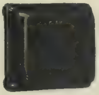
KEYSTONE CAR

ERN EQUIPMENT

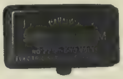


Hunter-Keystone Destination Signs

Clear, clean, readable signs to "Tell the public where you're going." Bold white letters on black roller curtains—clearly visible by day or night. They mark your routes, advertise your service, prevent mistakes and delays, and they wear well.



Faraday Buzzers

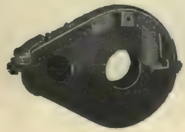


Faraday Car Signal Systems

Faraday Push Buttons

Faraday Passenger Car Signal Systems

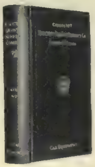
Reliable, convenient signal systems to enable passengers to signal operator without commotion and without distracting his attention. For high or low voltages; buzzers, vibrating or single-stroke bells; resistance panels; flush or surface type buttons—complete systems for every requirement.



Keystone Gear Cases

Many types. Made of soft, deep-drawing, open-hearth steel—tough enough to protect the gear and pinion body and to absorb vibration, flexible enough to prevent serious accident. Riveted and spot welded. Halves of any given type are interchangeable.

ASK for a copy of Catalog No. 7. Contains complete descriptions of nearly all of these items, also



- **Motormen's Seats**
- **Line Material**
- **Employees' Badges**
- **Portable Lamp Guards**
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- **Pinion Pullers**
- **Insulating Materials**
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Please ask for Data Sheets on Lighting Fixtures and Flood-Headlights.

ELECTRIC SERVICE SUPPLIES CO. Manufacturer

RAILWAY, POWER AND INDUSTRIAL ELECTRICAL MATERIAL

Home office and plant at 17th and Cambria Sts., PHILADELPHIA; District office at 111 N. Canal St., CHICAGO; 50 Church St., NEW YORK: Bessemer Bldg., Pittsburgh; 88 Broad St., Boston; General Motors Bldg., Detroit; Canadian Agents, Lyman Tube and Supply Company, Ltd., Montreal, Toronto, Vancouver.

EQUIPMENT . . .

Electricity Gives the

The Chicago Surface Lines operates G-E equipped trolley buses

G-E equipped trolley buses are now operating in Knoxville, Tenn.

G-E equipped trolley buses serve New Orleans, La.,

Salt Lake City, Utah, is also served by G-E equipped trolley buses

THE TROLLEY BUS

The modern G-E equipped trolley bus holds a thrill for every man in the transportation industry. It is fast, smooth, powerful, quiet—to a degree beyond any other public vehicle ever built. It weaves its way through traffic with unusual ease and has the additional advantage of curb loading.

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY
SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Best Ride

ON RAIL OR

ON RUBBER

THE smooth, powerful force of electricity, which has long been the life of urban transportation systems, has now given new impetus to the entire industry. To-day, the trolley bus and the gas-electric give the best ride on rubber. The smooth, fast acceleration of the electric motor continues, better than ever before, to serve the needs of transportation economically, dependably, safely. Let G-E engineers give you complete information.

ne of 12 double-deck G-E equipped gas-electric buses in Baltimore, Md.

Detroit, Mich., now has 142 G-E equipped gas-electric buses

THE GAS-ELECTRIC BUS

More than 2300 G-E equipped gas-electric buses are now on the road, and records prove the economy, flexibility, and dependability of their operation. In heavy city traffic, they have established high standards of performance that cannot be equalled with any other type of drive.

390-71

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

From the Day of the Horseless Carriage

AS early as 1903, when tillers, driving chains, and kerosene lamps were standard equipment on the horseless carriage, G-E engineers had designed and placed in service an electric transmission for gas-electric buses. And not one year has passed, since 1903, without the application of G-E equipment to some form of self-propelled vehicle. In step with the advances in automotive design, G-E engineers have perfected the modern electric transmission—an outstanding contribution to bus transportation. There are now more than 2300 G-E equipped buses in service.

In 1921, General Electric supplied equipment for the operation of seven trolley buses on Staten Island—the first commercial installation in the United States. Subsequently, many more trolley buses were placed in service. As a result of all these years of experience, General Electric has recently developed light-weight 35- and 50-horsepower trolley-bus motors and also an automatic foot-operated control that provides the fast, smooth acceleration essential to meet modern traffic conditions.

330-162

GENERAL ELECTRIC

ELECTRIC RAILWAY JOURNAL

New York.
April, 1931

Consolidation of
Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., *Editor*

Volume 75
Number 4

Companies Will Gain by Speeding Maintenance Programs Now

MAINTENANCE, like the poor, is always with us. No matter whether business is good or bad it is necessary to keep a transportation property in condition to render effective service. That railway operators realize this is shown by the budgets for the industry made up for the current year. According to figures compiled by this paper and published last January, the expenditures proposed during the current year are $214,900,000, compared with $214,600,000 spent in 1930. These amounts, almost equal, are only some $7,000,000, or 3.2 per cent, less than the expenditures for maintenance made in 1929, which was particularly good from the standpoint of revenue, and during which the most money was spent for maintenance in several years.

Despite the amounts budgeted, the maintenance programs on some railways have been held more or less in abeyance. Naturally, with reduced revenues and the necessity to economize, the tendency is to hold down expenditures along every line as far as practicable. But there comes a time when policies of this kind cannot be continued without danger to the property, let alone the quality of service. A property under-maintained is likely to find itself losing revenue. That makes the situation so much worse.

It is essential to go ahead with major programs of work long before any such point is reached. Nor has there been a more propitious time to engage in a major program of maintenance than the present. Materials and labor are at rock-bottom prices. The efficiency of the worker is higher than it has been at any time since the war. Accordingly, the dollar spent today will purchase more than for many years. Not only should current repairs be made to the full, but projects for permanent improvement can be conducted today at a lower cost than is likely to be possible at any time in the near future.

Every company should by all means do whatever it can to speed its maintenance program. In many ways it will be the gainer. Besides the actual saving in cost, any additional employment that can be given now—and maintenance or construction work is largely one of labor—will do its full share to reduce unemployment and so speed the day when there is an improvement in general business. And in this, transportation has a heavy stake.

▼

Electric Railways Have Good Employment Record

IN RETAINING practically all of its employees on the payroll during business depression, the electric railway industry has made a notable record. Reports reviewed from 132 companies in a nation-wide survey just completed by the JOURNAL show a decrease of less than 7 per cent in the number of employees between 1929 and 1931. Compared with many other industries this is remarkably good. In part it is due to the inherent stability of the local transportation industry. In a considerable measure, however, it is the result of earnest efforts by electric railway managements to avoid adding to the widespread unemployment. Gratification at this notable achievement of the industry was expressed by President Hoover when he was shown the results of the JOURNAL's survey. Detailed figures are given in an article appearing elsewhere in this issue.

Analysis of the data developed by the survey discloses several significant facts. The decrease in the number of employees has been considerably smaller than the decrease in traffic which has resulted from the business depression. The population served has apparently had little influence on the electric railway employment situation, the records of some of the smaller city properties being quite as good proportionately as some of those in large metropolitan centers. Improved facilities have brought about some reduction in shop personnel. Weather conditions have been generally less severe during the early part of this year than in either of the past two years, resulting in the need for fewer men to keep the lines open. One-man operation has not had any noticeable effect in reducing the number of employees.

Considering all these facts it may be said that employment conditions in the electric railway industry have been remarkably stable during the past two years. Moreover there has been no marked trend toward reduction in wage rates. Some reductions in total wages paid have been made by curtailment of working hours. On the whole, however, the workers employed by the electric railways have fared extremely well during a period of severe depression.

▼

Encouraging Care in Handling Vehicles

OWNERS of private automobiles usually handle their vehicles with the utmost care. But when acting as a paid driver of an automobile belonging to somebody else, the same individual gives less thought to possible injury to the vehicle. That is only human nature. This characteristic oftentimes causes the operator of a public transportations vehicle to disregard the well-being of his car or bus. Knowing that the maintenance forces are responsible for keeping the vehicles in satisfactory running order he is inclined to be rather careless and thoughtless about the effect of his own actions.

Operators usually are given thorough instruction in the fundamentals of the equipment at the time they first enter the employ of the railway. Along with instruction in the handling of the vehicles, they are taught the specific functions of its various parts. This initial training is highly important, but the problem does not end there. They always must bear in mind the money and effort required to keep these parts in good working condition.

An effective way of encouraging care in the handling of vehicles is to acquaint the operators fully with the work of the rolling stock maintenance forces. The operator who understands the number and intricacy of the problems involved in inspecting, servicing and maintaining of cars and buses will be more careful in his treatment of the equipment than the operator who simply has a hazy idea that maintenance work is done somehow, somewhere by somebody. A comparatively slight effort expended in giving him this knowledge will be many times repaid in better handling of the equipment.

▼

Happy Days Are Here Again

AT THE turn of the century spring had certain harbingers that were unmistakable. Lilac-time in London brought out the mudgutter band in New York, tempted talkative Tony and his meandering monkey from their winter hiding quarters, and flooded the streets of nearly every city in the United States with open trolleys. Although that was not the particular refrain of the times, these things presaged for many people that "Happy Days Are Here Again."

Today, the old-fashioned open car is only a memory in many cities. No longer do we see it decorated with bunting, flags and colored electric lights and carrying a Sunday School excursion, chowder party or Sängerbund out into the open. Along with the three white chargers of the "Still Alarm," the open trolley was relegated into desuetude. Its death knell on most properties was sounded by the introduction of the pay-as-you enter system of fare-collection.

Certain New York City lines, however, have stuck to the use of open cars. Their shortcoming are recognized. But they are popular. They have a strong appeal. Men who want to smoke patronize them liberally. These cars are a bit of old-time Manhattan set down in the modern metropolis.

While this is one of the comparatively few remaining examples of the use of equipment of this kind, it is not the only one. At least one other large city company still operates several hundred open cars and another company recently rehabilitated one of these cars as an experiment. Several others have continued their use in suburban and interurban service. Another favors the practice of substituting open cars for closed cars on its divisions which serve the beaches and the pleasure parks. It has found the double-truck open-bench car profitable despite the added expense resulting from the increased accident hazards, the cost of winter storage and the added platform expense due to two-man operation.

This is an industry endeavoring to cater to the public taste. Certain companies have found the open car a means to this end. May not others do so at slight cost to themselves for rehabilitation where the equipment already is available? The renaissance of style, which has seen the general return of the muff to fashion, and the threat of the bustle to come back, will not include the widespread restoration of the open trolley. Still, "Ride in the Open" is potent in its appeal That is cannot be gainsaid.

▼

Making It Easy for Employees to Study

MANY worth-while educational activities for electric railway employees have been undertaken during the past few years. In these programs the predominant idea has been that of group conference training. Excellent results are being obtained in this way on numerous properties. But there exists an even broader opportunity for employee education. It lies in encouraging the employee to use some of his spare time in reading what has been written about the problems connected with his daily work. This in no way conflicts with conference training activities but rather tends to supplement them.

Outstanding among ways to encourage employees to study is a plan developed by the librarian of the Boston Elevated Railway. Under his direction, a comprehensive bibliography has been compiled and printed, listing a vast number of articles and books written on subjects pertaining to the operation of urban and interurban electric railways and bus service. This list was not prepared primarily for the general manager and the department heads, although it is much used by them. It was prepared to tell the foremen and supervisory officials where they can find information that will help them in their daily work. Copies are distributed to a list of men in each department selected by the department head. To all others who want them, copies are willingly furnished by the library.

By glancing through the bibliography, the employee learns what articles and books have been written on subjects with which he is concerned. If he finds something of interest he can borrow it from the company library or, if he prefers, from the nearest branch of the public library. Psychologically, the great advantage of this plan is that it enables the employee to secure educational literature without going to some one of his superiors and confessing his need for enlightment.

The very nature of the plan precludes the possibility of measuring accurately the resulting benefits. Every indication, however, points to its being an extremely valuable part of the company's educational program.

▼

Extending Wood Preservation to Vehicle Construction

WOOD preservation has been thought of most frequently in connection with cross ties and poles. Today, there is no question as to its advantages for such purposes, and many electric railways and steam railroads use treated ties and poles to the exclusion of plain wood. Records extending over a long period prove that its superior lasting qualities far outweigh the cost of treatment.

For street car and bus body construction wood has certain advantages, and its use always has been favored by a large group of operators. The facility of replacement of wood parts after accidents is a potent argument in its favor. But its use, either for framing or as a finishing material, is open to the disadvantage that it deteriorates quickly when it is subjected to a succession of moisture and dryness. Framing of the vehicle, particularly posts that are completely covered, may rot so much in two or three years that replacement is required.

It is only in the past few years that transportation men have given serious consideration of the possibility of obviating such difficulty in the use of wood by means of preservative treatment. One argument against wood preservation is that the methods in use for treatment of heavy timber require saturation with materials that make the wood difficult to work and give it a bad surface. This renders them unsuitable where an inside or outside finish is desired. However, a number of preservatives have been developed that produce the desired result without disfiguring the product. Some of these work well with a brush or dipping treatment, so that they can be used after the wood has been milled to size.

As to results, the method is so new that very few roads have records extending over a sufficient time to prove the value of the treatment adopted. The subject is being taken up actively by the committee on wood preservation of the American Electric Railway Association. Reports that have been received from properties treating wood for such purposes have been almost universally favorable, and it is believed that material savings will be obtained. It appears that the treatment methods are justified, and that their use should be extended.

▼

An Opportunity for Self-Examination

WHEN the need exists, as it does today, to get the most out of every dollar expended, there is an opportunity for the maintenance departments of electric railways to do a little investigating—of themselves, by themselves and for themselves—to see if practices and facilities have been adjusted to meet the conditions that exist now. Perhaps it will be found that changes have not been made to follow the progress of the art or the needs of the present.

As an example of how practices are allowed to continue regardless of the need, five years ago an electric railway instituted bus service with a comparatively small fleet. In formulating practices for their care and in providing facilities, the company decided that an oil reclaimer was not justified. Only recently a survey showed that with the greater number of vehicles now operated a substantial amount could be saved with a reclaimer. Another railway found that two men were employed to tighten hub nuts on bus wheels every day and that this work was unnecessary. It was learned that the order for this work was given several years ago, when a wheel came off and caused a slight accident. These examples show the possibilities that exist for adding new equipment and shifting men to advantage.

To determine whether such opportunities exist on a property, periodic self-examinations may well be made. Is the present system strictly modern? Are any duties being performed which are unnecessary? Is every man being used to best possible advantage? Have all the labor-saving machines and tools been installed that the size of the operation will justify? Are departments arranged to obtain maximum efficiency in caring for equipment? Is the system of records adequate? Is it too involved? Are the stock rooms so arranged that materials can be obtained quickly and so that available quantities can be noted readily?

Even a hasty check on any property would reveal numerous opportunities for weeding out obsolete practices and making profitable adjustments. When a searching analysis is made it likely will point the way to many improvements. Consistent effort should be expended in modernizing every detail of the present maintenance system. It will be amply rewarded by higher standards of work—and the result will be obtained at a lower cost.

Securing the

CO-OPERATION OF THE EMPLOYEE

No man will do his best work unless he is proud of the company and his connection with it. This attitude cannot be developed by printed rule books, but only by direct personal contact with the management

By

E. K. HALL

Formerly Vice-President in Charge of Public Relations
American Telephone & Telegraph Company

FEW industries can get along today without the full co-operation and support of their employees. Public utilities where there is direct contact between the customer and the employee need this support even more than others. It can be secured if the problem is approached in the right way, but it can easily be lost if the problem is approached in the wrong way.

The importance of securing the co-operation of the employees is not always fully realized. Some hard-boiled executives of the old school contend that the employee is simply a cog in the machine and that if he performs his work with mechanical accuracy, the spirit in which he does it is a matter of no particular consequence. Nothing could be further from the truth. In fact, the spirit which actuates the employee is really of greater importance even than his technical skill.

Suppose every operator of an electric car or bus was as keenly interested in its condition as he is in the new radio set he purchased last month. Suppose every employee in the carhouse or shop was as keenly interested in preventing waste and saving money for the company as he is saving his own money. Suppose the attitude of every car or bus conductor was such as to make the passenger look forward with pleasure to riding on his vehicle. What would this be worth to the company? Its value would be incalculable.

In many companies a spirit of co-operation between employer and employee prevails to a marked degree. In others it is notably absent. But there is no reason why it should not prevail in every company. No magic is required to secure it, but only the application of common sense.

Before the solution of the problem can be worked out, it must be admitted that the problem exists. Some business executives are curiously hesitant about this. In legal matters they do not claim to be experts. In technical matters they do not claim to be qualified engineers. But in matters pertaining to the employee they will not admit that anyone else knows more than they.

When it is recognized, however, that there is a real problem in securing the co-operation of the employee, the door is open to a solution. It cannot be done by any book of rules, no matter how elaborate nor how well-prepared. It cannot be done by nagging, bulldozing or preparing reports of employees' shortcomings. It cannot be done simply by offering the employee a financial inducement, even if the company could afford it. It cannot be done by a series of sermons or lectures regardless of the eloquence of the lecturer. It can be done only by stimulating the willingness of the employee to do his very best for the company.

Willingness of the employee to do his best depends in large measure upon his being proud of the company and his connection with it. You never can get a man to do his best unless he has a feeling of pride in his work. How to develop this pride is the problem. Giving the employee good tools is a step in the right direction. There can be no doubt that the motorman and conductor of a clean, attractive, modern electric car have more pride in their work than would the same men on a shabby old car of the vintage of 1905. Similarly, they have more pride in themselves if they are wearing neat, trim, good-looking uniforms, than if they must face the public in clothes showing the results of long, hard wear. From the standpoint of securing the most efficient service from the employee, it is well worth while for the company to give him every possible help and encouragement in maintaining a high standard of personal appearance.

While uniforms and equipment are valuable aids in securing the co-operation of the employee, there is something else which is far more important. This is knowledge. For a man to be proud of his company, he must know about it. He must understand its policies, its methods, and its problems. Tell him your story. Take him into your confidence. It's the only way to gain his full support.

Unless the employee understands what the company is up against, he cannot play his own part effectively. Make him want to fight the company's battles by making him a part of the company. Make him feel that he and the management are working together against odds. Give

E. K. Hall

PROBABLY no one in the business world today has given more thought than E. K. Hall to the philosophy which should guide the relations between the employer and the employee. To the general public he is perhaps best known as the Chairman of the Intercollegiate Football Rules Committee, but behind that lies a most interesting business career. A lawyer by training, he early became associated with the New England Telephone & Telegraph Company. Quickly realizing that the source of a large majority of incidents resulting in litigation was the act of some individual employee, he began to study ways to secure more effective co-operation between the company and its employees. So successful was he in this work that he was later invited to broaden the scope of his activities as vice-president in charge of public relations, American Telephone & Telegraph Company. It is not too much to say that his was the original inspiration behind "the voice with a smile." In this article he draws upon his own extensive experience to suggest ways for securing the co-operation of electric railway employees.

him a chance to fight against obstacles in the same way the managers are forced to do. The fighting spirit is stimulating. It breaks the monotony of routine; every man responds to contest. Discuss with him at length what public relations are and what they mean to the street railway; why you are under certain definite obligations to the public; what a favorable public attitude may mean to the success of the company, as well as the detrimental effect of an unfavorable attitude. If the public is constantly hostile, the company cannot get ahead. If, on the other hand, people like the service, and the way it is furnished, the benefit will be immeasurable.

It can be made clear to the men that all are in the same boat; interested in the success of the company in the same way. Of course, each has different kinds of responsibilities, but that's the only difference. When the individual employee understands when, where, and why his co-operation is needed and welcomed, he will usually be right there to deliver it.

It is not difficult to instill understanding of the company's problems in the minds of the employee, but it must be done in the right way. The printed word is not sufficient no matter how skillfully used. By this I do not mean to imply the slightest criticism of the company house organ, or efforts along similar lines. All these things are good. But they are not enough.

You will never get the right understanding among the men in the ranks unless they get an opportunity from time to time to meet and talk with the big boss—not necessarily the president of the company, but the man who is looked upon as the directing authority. He must make his personality felt. Of course, he cannot do all the work alone. He must have lieutenants to help him, but he should not leave it all to them. No endeavor of this kind will get very far unless the top executive puts himself into it heart and soul and sets the example and the pace for the others.

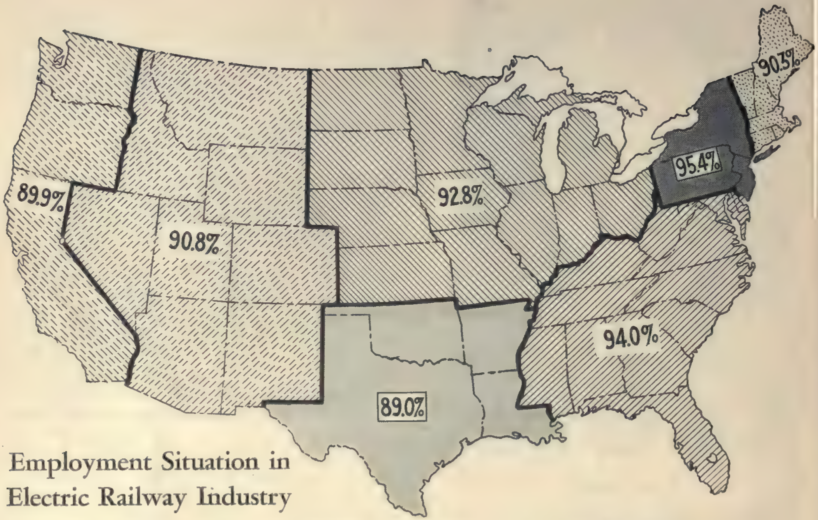
In doing this job of bringing the employee to an understanding of the business, best results will be obtained if it is kept somewhat separate from other training or educational activities. It is obviously important that the employee be trained to technical proficiency in his work, but that is something quite different from enlisting his willingness to carry his full share of the whole load, and the two activities should be kept distinct. Accident prevention is another important endeavor, especially so in an industry involving the transportation of millions of people every day. But this, too, is a distinct problem and is only one incident in building employee morale.

The right approach is of great importance in the telling of the story to the men. Too much emphasis should not be placed on the urgency of the company's need. Too much emphasis should not be placed on the obstacles the company is facing. An apologetic or defensive attitude will get nowhere. A positive constructive stand will get much further. The men must feel that they are helping in a distinctly worthwhile undertaking.

When discussing this subject with the men, the executives should not do all the talking themselves. The men are the ones on the firing line—ask them their opinions. The average man responds quickly to the idea that his experience and opinion are needed by the management. They know where and when they can help most. They are over seven and most of them are intelligent. Many will prove to be resourceful if given their chance. Bear in mind that the management is not in complete possession of every fact. Common, every-day occurrences are usually better understood and handled by the man on the firing line if he has been taken into the management's confidence.

Above everything else, lay all your cards on the table. Stress frankness; but you must have a sound situation. If you haven't—clean it up.

Good management makes better and happier employees. Loyalty is what is needed—that feeling of "rarin' to go" for the company. Scores of things contribute to developing this attitude. Plans must be formed intelligently and executed energetically. This business of getting co-operation of employees is not an abstruse matter. It's just a matter of plain common sense and perseverence. It can be done whenever the management decides that it shall be done.



Employment Situation in Electric Railway Industry

GEOGRAPHICAL DISTRICTS show considerable variations in number of workers employed by electric railways in 1931 as compared with 1929. Percentages indicated on this map are based on reports received by ELECTRIC RAILWAY JOURNAL from the companies listed below

New England States

Androscoggin & Kennebec Railway, Lewiston, Me.
Bangor Hydro-Electric Company
Boston Elevated Railway
Boston, Revere Beach & Lynn Railroad
Concord Electric Railways
Connecticut Company.
Cumberland County Power & Light Company, Portland, Me.
Danbury Transportation Company
Eastern Massachusetts Street Railway
Middlesex & Boston Street Railway
Springfield Street Railway
Union Street Railway, New Bedford, Mass.
United Electric Railways, Providence, R. I.

Middle Atlantic States

Altoona & Logan Valley Electric Railway
Atlantic City & Shore Railroad
Conestoga Traction Company
East Penn Traction Company
Erie Railways
Harrisburg Railways
Hershey Transit Company
Indiana County Street Railways
Interborough Rapid Transit Co., New York
International Railway, Buffalo, N. Y.
Jamestown Street Railway
Johnstown Traction Company
Keystone Public Service Co., Oil City, Pa.
Lehigh Valley Transit Company
New York & Queens County Railway
New York Railways, New York City
New York State Railways, Rochester, N. Y.
Philadelphia & West Chester Traction Co.
Philadelphia Rapid Transit Co.
Pittsburgh Railways
Public Service Co-ordinated Transport
Richmond Railways, Staten Island, N. Y.
Schenectady Railway
Schuylkill Valley Traction Company
Scranton Railway
Third Avenue Railway, New York City
Trenton Transit Company
Triple Cities Traction Corporation, Binghamton, N. Y.
York Railways
Wilkes-Barre Railway
Williamsport Railways

Southeastern States

Capital Traction Company, Washington, D. C.
Carolina Power & Light Company, Asheville, N. C.
Carolina Power & Light Company, Raleigh, N. C.
Charleston Interurban Railroad
Cincinnati, Newport & Covington Railway
Georgia Power Company, Atlanta
Jacksonville Traction Company
Kentucky Traction & Terminal Company
Louisville Railway
Louisville & Interurban Railway
Lynchburg Traction & Light Company
Memphis Street Railway
Miami Beach Railway
Mobile Light & Railroad Company
Mobile Railway & Light Company
Roanoke Railway & Electric Company
South Carolina Power Company, Charleston, S. C.
Tampa Electric Company
Tidewater Power Company, Wilmington, N. C.
Virginia Electric & Power Co., Richmond
Virginia Public Service Company
Washington, Baltimore & Annapolis Electric Railroad
Washington Railway & Electric Company
Wheeling Traction Company
United Railways & Electric Company, Baltimore, Md.

Central States

Arkansas Valley Interurban Railway
Cedar Rapids & Marion City Railway
Chicago & Joliet Electric Railway
Chicago Rapid Transit Company
Chicago, North Shore & Milwaukee R.R.
Chicago, South Shore & South Bend R.R.
Chicago Surface Lines
Cincinnati Street Railway
City Railway, Dayton, Ohio
Cleveland Railway
Columbus Railway, Power & Light Co.
Dayton Street Railway
Dayton-Xenia Railway
Duluth Street Railway
Eastern Michigan Railways
Eastern Michigan-Toledo Railroad
Gary Railways
Grand Rapids Railroad
Indianapolis Street Railway
Kansas City Public Service Company.
Lake Shore Electric Railway
Madison Railways
Milwaukee Electric Railway & Light Co.
Northern Indiana Railway
Oakwood Street Railway, Dayton, Ohio
Omaha & Council Bluffs Street Railway
People's Railway, Dayton, Ohio
Springfield Railway, Springfield, Ohio
Steubenville East Liverpool & Beaver Valley Traction Company
St. Louis Public Service Company
St. Joseph Railway, Light, Heat & Power Company
Twin City Rapid Transit Company
Union Traction Company, Coffeville, Kan.
Waterloo, Cedar Falls & Northern Railway

Southwestern States

Dallas Railway & Terminal Company
Eastern Texas Electric Company
El Paso Electric Company
Galveston Electric Company
Houston Electric Company
New Orleans Public Service, Inc.
Northern Texas Traction Company
Northeast Oklahoma Railroad
Oklahoma Railway
San Antonio Public Service Company
Tarrant County Traction Company
Texas Electric Railway
United Service Company, Tulsa, Okla.

Mountain States

Butte Electric Railway
Colorado Springs & Interurban Railway
Denver Tramway
Utah Light & Traction Co., Salt Lake City.

Pacific States

Central California Traction Company
Fresno Traction Company
Market Street Railway, San Francisco, Cal.
North Coast Transportation Company
Pacific Gas & Electric Company, Sacramento, Cal.
Pacific Electric Railway
Pacific North West Public Service Company
Peninsular Railways
Sacramento Northern Railway
San Francisco Municipal Railway
San José Railroads
Seattle & Rainier Valley Railway
Seattle Municipal Railway
Stockton Electric Railroad
Tacoma Railway & Power Company
Visalia Electric Railroad
Yakima Valley Transportation Company

Employment Conditions Stable

in the

Electric Railway Industry

Few men have been laid off during present business depression. Nation-wide survey made by the *Journal* shows the present total number of employees of 132 companies to be approximately 93 per cent of the number employed by the same companies two years ago

By

JOHN A. MILLER, Jr.

Editor *Electric Railway Journal*

STABILITY of employment in the electric railway industry is impressively shown by figures compiled through a nation-wide survey just completed by the JOURNAL. This survey covered a total of more than 150,000 employees of 132 electric railways in 36 states and the District of Columbia. The companies answering the JOURNAL'S inquiry on this subject operate about 65 per cent of the industry's cars, own 60 per cent of the total city and interurban trackage in the United States, and employ 70 per cent of the total personnel. Their experience, therefore, may be assumed to reflect accurately the experience of the entire industry. The survey shows that the number of employed workers is now about 5 per cent below the figure of a year ago and about 7 per cent below the figure of two years ago.

Changes in the number of employed workers during the past two years have been somewhat greater in certain sections of the country than in others. The Middle Atlantic States—New York, Pennsylvania, and New Jersey—show the smallest decrease in employment, the number of workers in 1931 being more than 95 per cent of the number in 1929. In the Southeastern States—including Maryland, Delaware, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, and Mississippi—the decrease has likewise been extremely small. A slightly greater decline amounting to about 7 per cent is recorded in the Central States—Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North and South Dakota, Nebraska and Kansas. The Southwestern States — Oklahoma, Texas, Arkansas and Louisiana—show a drop of approximately 11 per cent. The Mountain States, the Pacific Coast, and New England all report declines of about 10 per cent in the past two years.

Population of the territory served has had comparatively little influence on the employment situation. Among the electric railways in cities of more than 1,000,000 population the decrease in the number of persons employed in 1931 as compared with 1929 is very slight. A group of eight such properties reports approximately 98 per cent as many employees today as in 1929. The Interborough Rapid Transit Company in New York City, which has the largest number of employees of any railway included in the survey, shows a substantial gain. The Chicago Surface Lines, with almost as many employees, shows a decline from 17,862 to 17,660, or about 1 per cent. Most of the others report somewhat larger reductions but the figures for the group as a whole are extremely satisfactory.

A group of ten companies in cities from 500,000 to 1,000,000 population shows an average decline of 8.5 per cent in employment. In this classification, the Municipal

Summary of Electric Railway Employment Reports

Geographical District	Companies Reporting	Miles of Track	Number of Cars	Office Employees			Transportation Department Employees			Shop, Track and Electric and Line Department Employees			Total Employees of Companies Reporting		
				1929	1930	1931	1929	1930	1931	1929	1930	1931	1929	1930	1931
New England......	12	2,433	5,218	1,471	1.445	1,311	10.039	9.630	9,020	6,771	6.539	6,176	18,281	17,614	16,507
Mid. Atlantic States.	30	4,110	13,781	5,365	5,020	4.887	26,762	26.280	25,317	18.981	18.869	18.404	51.108	50.169	48,608
South Eastern States	23	2,251	4,648	1,555	1.527	1,471	9,230	8,985	8,434	5,346	5,452	5,244	16,131	15.964	15,149
Central States......	33	6,020	14,202	3,266	3,376	3,233	36,380	36,036	33.995	17,782	17,287	16,047	57,428	56,699	53,275
South Western States	13	1,255	1,961	812	863	794	3,912	3,779	3,655	3.016	3,179	2,445	7,740	7,821	6.894
Mountain States.....	4	377	625	277	270	254	1,054	1,041	926	581	595	555	1,912	1,906	1.735
Pacific States........	17	2,934	3,418	1,404	1,396	1,316	8,477	8,139	7.819	6,283	6.080	5,404	16.164	15.615	14,539
Total	132	19,380	43,853	14,150	13,897	13,266	95,854	93,890	89,166	58.760	58,001	54.275	168,764	165,788	156,707

Railway of San Francisco, with a gain of 1.8 per cent, is the only property to report an increase. In most instances the decreases have been slight, as for example in Boston, where there has been a reduction of about 5 per cent. One property, however, reports a decrease of 11.5 per cent, and another one of 16.4 per cent.

Sixteen companies in cities from 250,000 to 500,000 population show a decrease of 9.2 per cent. No cities in this group report an increase. The two properties in Washington, D. C., however, report practically the same number of employees today as two years ago. On other properties the size of the decrease varies considerably. For example, Seattle, Wash., shows a reduction of 5.2 per cent in the number of electric railway employees, Indianapolis, 11.2, and Atlanta, 14.8 per cent.

A combined decrease of approximately 10 per cent is reported by 22 companies in cities ranging from 100,000 to 250,000 population. In this group only one city, Miami, Fla., reports an increase. The Dayton Street Railway and the Trenton Transit Company show no change. Decreases ranging from about 2 per cent to as high as 25 per cent are shown by the other nineteen companies in the group.

President Hoover Praises Electric Railway Employment Record

WHEN SHOWN the results of a survey by ELECTRIC RAILWAY JOURNAL indicating that present employment in the electric railway industry is within 7 per cent of that of the prosperous year of 1929, President Hoover evidenced keen interest and expressed appreciation of that accomplishment. At the beginning of the business depression, the President emphasized the importance of efforts to stabilize employment to the maximum possible extent. The way in which this has been done by the electric railways he considers extremely creditable.

GOOD RECORD IN SMALLER COMMUNITIES

In comparison with the other groups, the companies in cities between 50,000 and 100,000 population have made a particularly good record. A group of 22 such companies shows a decrease of about 5 per cent. Two report slight increases in the number of employees. These are Mobile, Ala., and Schenectady, N. Y. Several others report no changes or very slight decreases. For example, a reduction from 231 to 225 employees was made by the York Railways. This is approximately 2 per cent. Ten other companies show small declines, while the others range upward to a maximum of about 10 per cent in two instances.

An equally good record was made by the companies serving cities of less than 50,000 population. Twelve such companies show a decrease of 5.6 per cent. Three of the twelve report moderate increases. For example, the Yakima Valley Transportation Company has enlarged its organization from 45 to 50 persons, a gain of 10 per cent. Two others report no change. Decreases of moderate extent are reported by the other seven properties in this group.

A group of twelve combined city and suburban railways shows a decrease of 14.8 per cent in two years. None of these companies shows a gain, but several show very slight decreases. For example, the Eastern Massachusetts Street Railway now has 1,980 employees as compared with 2,009 two years ago—a reduction of only 1 per cent. The Virginia Public Service Company is another which has made a reduction of only 1 per cent in the number of its employees. Public Service Co-ordinated Transport reports a decline from 7,763 to 7,452, or a decrease of a little less than 5 per cent.

In the interurban field, a group of twenty railways shows a decrease of 15 per cent in the number of persons employed in 1931 as compared with 1929. Of these twenty companies, however, four report increases ranging from 10 per cent to 160 per cent. These companies are the Philadelphia & West Chester Traction Company, the Kentucky Traction & Terminal Company, the Sacramento Northern Railroad, and the Northeast Oklahoma Railroad. The last mentioned is the property on which the largest increase occurred. This was due to the acquisition of a portion of the Joplin & Pittsburg Railway and its rehabilitation. Six companies report moderate decreases and ten report substantial reductions in the number of employees.

For the purpose of this study the employees were divided into three major classifications: (1) clerks, stenographers and office employees; (2) motormen, conductors, operators and others directly connected with the

Comparison of Number of Employees of Electric Railways—1929-1931

Classified by Size of Cities

		Number of Employees			Per Cent Net Change in Two Years
		1929	1930	1931	
8	Railways in cities over 1,000,000 population (Includes both rapid transit and surface lines)	59,884	59,627	58,518	— 2.1
10	Railways in cities 500,000-1,000,000	42,026	40,992	38,443	— 8.5
16	Railways in cities 250,000-500,000	24,363	23,987	22,039	— 9.2
22	Railways in cities 100,000-250,000	10,500	10,411	9,380	—10.6
22	Railways in cities 50,000-100,000	5,814	5,716	5,479	— 5.5
12	Railways in cities under 50,000	1,151	1,172	1,086	— 5.6
12	Combined city and suburban railways	14,655	14,021	12,488	—14.8
20	Interurban Railways	9,111	8,620	7,733	—15.2
10	Unclassified	1,260	1,242	1,241	— 1.6
132	Totals	168,764	165,788	156,707	— 7.0

transportation service; (3) employees in shops, garages, track departments, line departments, substations and power stations. Employees of electric departments of combined railway and power companies were not included in the survey. The distribution of employees among these three groups is approximately 8 per cent in the office, 57 per cent in the transportation department and 35 per cent in the shop, track and electric departments. The survey shows that the smallest decrease occurred in the office group, which today has about 94 per cent of the number of employees of two years ago. In the transportation department the present number is 93 per cent of that of two years ago, while in the shop, track and electric departments the total is only 92 per cent.

Necessity to reduce operating expenses has evidently been the most important cause of such reductions as have been made. At the same time, a variety of other factors have entered into the situation to a certain extent. Several railways explain the decreases reported as being due to the transfer of power generation activities from the railway to an affiliated electric light and power organization. Another reason given for reduced employment during the early part of the present year as compared with last year and two years ago is the milder weather which has prevailed. Several companies in the northern part of the country report that they have employed fewer men because of the comparatively open winter and the absence of snow and ice. From the South come reports that the dry weather has simplified the track maintenance problem and it has not been necessary to employ so many men this year for that work. Improved shop facilities have permitted a reduction in the shop force on one property. These factors have been responsible for a good part of the decrease in the "maintenance" group of employees.

In the transportation department, curtailment of service appears to account for most of the reduction in personnel. Other factors, however, have also exerted some influence on the situation. Sale of subsidiary bus operation accounts for a decrease in the number of employees on one property. Change-over from two-man operation to one-man operation appears to have caused no marked change in the employment situation during the past two years.

From the replies received, it is evident that electric railway managements are making earnest efforts to avoid laying off their employees. The general manager of one property states:

"We are carrying more employees in 1931 than in either of the two preceding years. This is because we have endeavored to do our part in meeting the unemployment situation by carrying on a full schedule of track work. Our usual policy has been to cut the track force down to emergency proportions during the months that frost is in the ground, but, instead of following this policy during the present winter, we have carried on extensive track work in paved streets where the frost problem is least serious."

Another reports that his company has followed the policy of retaining on the payroll all employees except those leaving the service for special reasons, but to refrain from hiring new men. This practice apparently has been followed generally throughout the industry.

Effect on Wages

Comparatively little change has occurred in wage rates since the beginning of the business depression. A few companies, mostly in the smaller cities, have made sligh reductions. In a number of instances, however, it has been necessary to place some of the employees on a part-time basis. The extent and effect of such part-time employment is incapable of exact measurement, but it has, of course, resulted in some reduction in the total wages paid by the industry.

Open Cars Popular in Honolulu

While electric railway operators in the northern part of the United States have been busy keeping their lines clear of snow and ice the Honolulu Rapid Transit Company is seeking the patronage of winter tourists to Hawaii by operating attractive open cars of this type.

NEW SHOP FACILITIES For *Lackawanna Electric Trains*

Periodic running inspection is being done in a new building erected at Hoboken adjacent to the passenger terminal. Heavy running repairs will be carried out at the Kingsland car shops

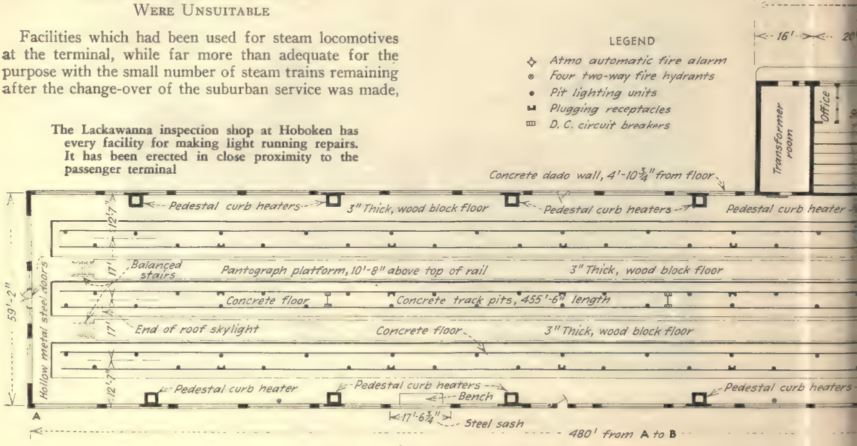
WHEN the Delaware, Lackawanna & Western Railroad electrified its suburban service running out of Hoboken, N. J., it was necessary to provide facilities for inspection and repair of the multiple-unit cars with which the system is equipped. At present there are 141 units, each made up of a motor car and a trailer with control equipment, semi-permanently coupled together. These units are made into trains of suitable length up to a maximum of twelve cars. Power for operation is obtained from a 3,000-volt direct-current supply through an overhead contact line. The 282 cars used in the electric service comprise slightly less than 30 per cent of the total passenger rolling stock of the railroad. The electrical installation was discussed in considerable detail in this paper for August, 1929, page 767.

STEAM LOCOMOTIVE FACILITIES WERE UNSUITABLE

Facilities which had been used for steam locomotives at the terminal, while far more than adequate for the purpose with the small number of steam trains remaining after the change-over of the suburban service was made, were entirely unsuitable for use with electric motor cars. The principal structure was a roundhouse located in the Hoboken yard just west of the terminal train shed. Since this location was found the most suitable one available, it was decided to tear down a portion of the round house no longer needed in order to make room for a new one-story building for light inspection of the multiple-unit rolling stock. This building has a main bay 59 ft. 2 in. wide and 480 ft. long. The east or front end is permanent, while the west wall is of temporary construction so that the building may be extended whenever it becomes necessary.

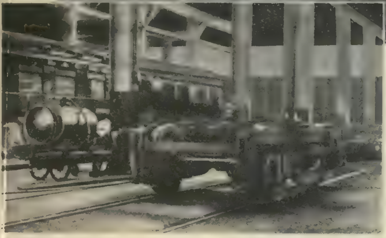
Three tracks extend through the building. Each track has a pit 455 ft. 6 in. long, or practically its full length except for a distance of about 15 ft. at the east entrance. Between tracks are two platforms at the height of the car roofs for ease in inspecting pantographs and roof equipment. These are reached by hinged steel stairways which swing out of the way when not in use.

At the front end of the shop extending back for 89 ft. the building is 81 ft. 5 in. wide, giving space for two additional tracks. These two tracks are intended for



The Lackawanna inspection shop at Hoboken has every facility for making light running repairs. It has been erected in close proximity to the passenger terminal

Five tracks enter the inspection shop from the east end. The three at the left extend the full length of the building and have pits beneath. Two shorter tracks at the right are devoted to truck work

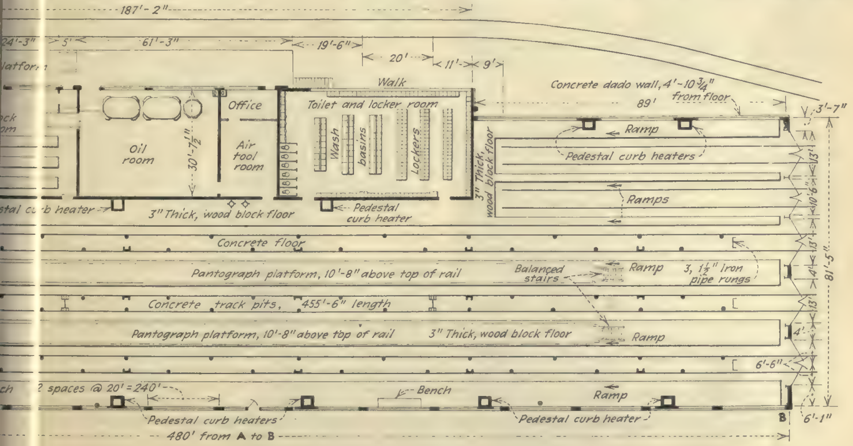


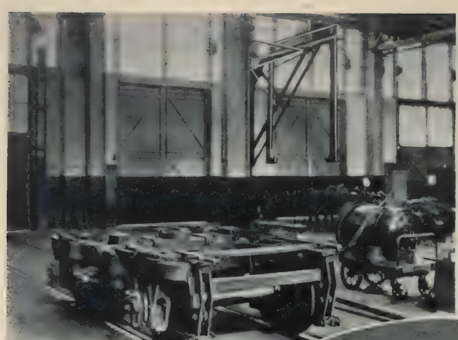
Pits will be installed on two tracks in the Kingsland car shop for work on the multiple-unit equipment

ruck work and do not have pits. Behind this wider sec-
ion extends a bay for a distance of 187 ft. 2 in., which
s separated from the main shop by a fire wall. This sec-
ion contains the transformer room, the stockroom, the oil room, the air brake room, and a large toilet, wash and locker room. Particular attention has been paid to the sanitary facilities. There are 58 wash basins and 224 steel lockers of the latest type.

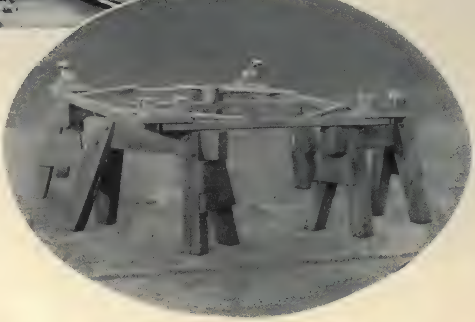
THE FLOOR IS DEPRESSED TO FACILITATE THE WORK

The floor of the shop, except for a short section at the east end, where it is at rail height, is depressed approximately 16 in. below the rail level. A ramp connects the two levels. The floor is of concrete, except for those sections where heavy pieces of equipment are likely to be set down. Such portions are floored with 3-in. treated wood blocks. The rails are set on cast-iron chairs, spaced about





Facilities are being installed in the truck shop at Kingsland for motor work. The hook seen at the right is for lifting car bodies with a crane



Jigs are used for assembling pantographs to insure correct alignment

4 ft. apart, but arranged so that they will not come over the electric pit equipment.

The front end of the shop is served by a crane of capacity sufficient to lift one end of a car in order that the truck may be run out. To facilitate this process, a car hook is provided, which may be picked up by the crane and shifted to any track desired.

Concrete Pits Are Well Lighted

The pits are of concrete, and are well lighted by wall units spaced approximately 25 ft. apart, and staggered on the two sides so that there is a lamp approximately every 12½ ft. There also are plugging receptacles in the pits for supplying current to portable electric tools. Circuit breakers for the direct-current lines are placed conveniently to the receptacles.

Direct current for shop tools is supplied from two 250-volt motor-generator sets taking power from the local alternating-current supply. These are installed in the transformer room. The 250-volt d.c. also is used for moving the cars about under their own power, connections being made by means of flexible leads which may be plugged into receptacles on the cars. Through this arrangement, it is unnecessary to carry the high-voltage trolley wires into the building. Shop lighting is from the 115-volt a.c. lines.

The stockroom carries a supply of such parts as are likely to be needed for repairs at the periodical light inspections, but no attempt is made to keep on hand at Hoboken such materials and parts as may be required in connection with the heavy overhaul. These are stocked in the general storeroom at Kingsland. Since the latter point is only a few miles away, the stock can be drawn on in an emergency.

For fire protection there is an installation of the Atmo automatic fire alarm system, which is connected to the Hoboken and Jersey City fire departments. Besides this, fire extinguishers are placed at various points, and there also is a 40-gal. chemical engine. Two-way fire hydrants are placed at convenient locations in the shop. These take their supply from a 10-in. salt water main. Attached to each hydrant outlet is a 50-ft. length of 2½-in. rubber-lined cotton hose with nozzle.

Heavier repairs and general overhauling will be taken care of in the general car repair shop at Kingsland, N. J., where the necessary facilities for the multiple-unit cars are being installed. Pits will be constructed on two tracks for handling equipment underneath the cars which can be reached most effectively in this manner. A separate room is being fitted up for motor repair work. This will have the customary equipment for armature and field winding, with a baking oven for armatures and coils. Any necessary repairs to trucks and bodies will be handled in the regular steam passenger car shops in which the electrical shop is being installed.

It is planned to give the cars a general overhauling every 18 to 24 months, as determined by their condition on inspection. This will correspond to between 60,000 and 80,000 miles. Inasmuch as most of the equipment has only recently been placed in service, the overhauling program is as yet tentative. Though this is the first extensive use of 3,000-volt d.c. for multiple-unit operation, even less difficulty than was anticipated has been experienced with the equipment. Barring accidents, it seems unlikely extensive overhauling of the cars will be needed during the next two years. Up to the present time heavy repairs were not required, and practically all the work has been done in the inspection shop at Hoboken.

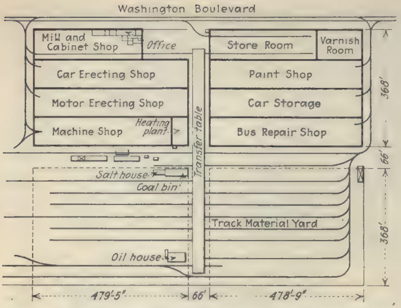
Complete painting facilities exist at the railway paint shop, where a personnel of 42 can turn out 50 hand-painted vehicles per month

Car and Bus Maintenance Co-ordinated *at Baltimore*

Reorganization expected to effect substantial savings and to increase efficiency in maintenance department. All vehicle repair work will be concentrated at the Carroll Park shops. Operation of all car and bus lines will also be centralized under direction of one superintendent

ALL transportation activities controlled by the United Railways & Electric Company, of Baltimore, were consolidated into a single organization in February of this year in order to handle the operating and maintenance problems more effectively. The separate staffs of the Baltimore Coach Company, a subsidiary of the railway company, which had previously operated and maintained all buses, were consolidated with the railway organization. This plan of consolidation of the maintenance and transportation departments was brought about after more than fifteen years of experience with separate organizations. After having thoroughly tried the dual organization for street car and bus units, the company has now adopted the unified and centralized organization to secure large savings and greater efficiency of operation and maintenance for the entire local transportation system. The extensive program of co-ordinating transportation facilities, which has been in progress since 1926, and the large number of street cars operated as compared with buses, were important factors in reaching the decision for the consolidation.

The United Railways & Electric Company was one of the pioneers in the electric railway industry to operate buses. Soon after the beginning of jitney competition in 1915 it organized the Baltimore Transit Company and the City Motor Company to lessen jitney competition and to pre-empt desirable routes. The latter company operated Ford jitneys, and the former a high class service on Charles Street. The organized bus operations grew and expanded, and by 1925 most of the independent



Layout of main shops at Carroll Park where new bus repair shop is located. An entire bay at the right of the transfer table has been devoted to the purpose

operators were either absorbed or had abandoned operations. At that time the railway controlled four bus operating subsidiaries which were consolidated into the Baltimore Coach Company on Jan. 1, 1927.

The Baltimore Coach Company up to the present has had an independent organization headed by a superintendent who reported to the general manager of the United Railways & Electric Company. The bus company superintendent had, in turn, direct supervision over a transportation superintendent and a superintendent of maintenance. According to the plans of consolidation the supervision, maintenance and operation of buses will be taken over by the street car personnel, the work which requires some special training in the automotive field being continued by the bus company personnel as part of the railway organization. Company officials believe that the technique of bus transportation has progressed to the stage where the more standardized methods of street car maintenance and operation can be adopted. Separate organizations, different methods of operation and maintenance, and separately trained operating and maintenance men are held to be unnecessary in Baltimore. That eventually men will be trained to operate both cars and buses, and that the greater part of maintenance and repair work of buses will be performed by men in the railway shops, is not considered an impossibility.

Organization of Bus Subsidiary Eliminated

As a result of the merger of the transportation departments, a superintendent of transportation, two dispatchers and a small clerical force, all formerly in the bus organization, were eliminated. The garages will continue as operating headquarters for the bus lines under the supervisor of bus operations, who will report directly to the superintendent of transportation. Movements will be controlled by the dispatcher in such a manner as to co-ordinate all vehicles moving.

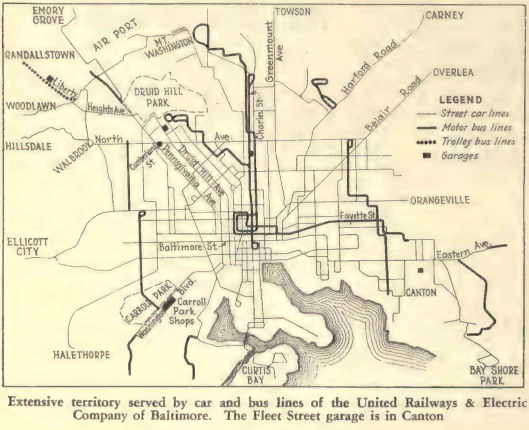
The Baltimore Coach Company owns and operates 94 regular route buses, twelve of which are double-deck buses, eleven special de luxe coaches for sightseeing and charter service, and three trolley buses. Its service equipment consists of 25 snow plows and four trucks. There are 60 miles of bus routes in Baltimore of which twelve miles are supplementary bus routes of the railway company, serving as feeders and extensions to car lines with transfer privileges to and from the car lines. The remaining 48 miles are regular bus routes of the Baltimore Coach Company, and, as such, do not enjoy transfer privileges with either the supplementary bus lines or the car lines. At present there are only six independent bus operators with eight buses on about 4 miles of route.

Receipts and expenses of the bus company will continue to be recorded separately. No change will be made in the status of the Baltimore Coach Company bus lines, as they will continue as independent lines with no transfer privileges to the railway company lines.

Bus Maintenance Transferred to Main Shops

An important physical change in the consolidation of the maintenance departments is the concentration of all bus repair work at the Carroll Park shops under the rolling stock and shop department. Formerly, all heavy repairs and overhaul of buses and trucks were done at two of the bus company's four garages which had special facilities, equipment and mechanics for such work. This work was in addition to the regular inspection and servicing of buses stored at those garages. The four garages are respectively located at Charles Street, Fleet Street, Druid Hill Avenue and Cumberland Street; all being at some distance from the main shops at Carroll Park. The heavy repairs and overhauls were divided between the Charles Street and Fleet Street garages. Engine overhaul and painting were done at Charles Street; repair and rebuilding of chassis, bodies, upholstery and storage batteries were concentrated at the Fleet Street garage.

Under the new plan, one of the group of eight large buildings at the Carroll Park shops, at which all cars are repaired and maintained, has been reserved exclusively for the new bus



Extensive territory served by car and bus lines of the United Railways & Electric Company of Baltimore. The Fleet Street garage is in Canton

repair shop. The building, 495 ft. long and 95 ft. wide, was formerly used for storage of inactive cars, having seven tracks with a capacity of more than 50 cars. The total floor space in this building is about 45,000 sq.ft., almost equaling the combined floor space at the four garages. Considering the location and its suitability for the new bus repair shop, it will be a great improvement over the poorly lighted and cramped quarters formerly used. Besides affording more than enough space for the present needs, the new building is adequately heated, has plenty of sunlight and has no obstructing posts or pillars.

Baltimore's large number of cars are repaired and overhauled in the erecting shop

As the spacious new bus repair shop appears without the equipment and machinery to be transferred later

At the present time, plans are being made for refitting and adapting the new building for bus repair work. It has been cleared of all railway equipment and material, leaving it bare for the distribution of bus machinery and equipment as it is received. Work benches will be installed and such machinery will be obtained as is needed exclusively for bus repair work. A study is now being made of the arrangement desired in the new shop, with a view to eliminating duplication in the machinery used for street car repairs. The work formerly done at the garages was analyzed and it was found that material savings in personnel and machinery for the bus repair work could be effected by this new grouping.

New Facilities Expected to Improve Maintenance

After the new bus shop has been completely organized and equipped, it is believed that improved working conditions due to better light, heat and air, improved equipment and organization, and the closer co-ordination with the railway repair shop will result in a higher grade of maintenance and repair work. The well-equipped machine shop with its 62 skilled mechanics will handle a large part of the machine work necessary for major bus overhauls. Likewise, the blacksmith shop, the mill shop and other repair shops will take over some of the bus repair work for which they are equipped and trained to do efficiently. This added work for the railway shops can be taken care of without any increase in equipment or personnel. It is believed that this distribution of repair work will lead to greater specialization by the bus repair mechanics, who will confine their entire time to engine overhaul, chassis repair and such special automotive work.

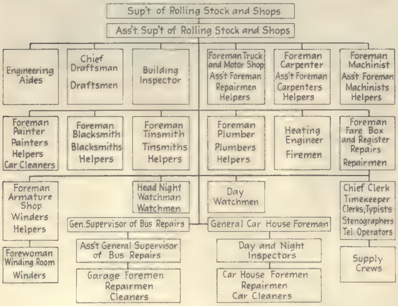
Buses are now spray-painted in an inclosed section of the varnish room

Buses will be painted in a small inclosed section of the varnish room by the two painters transferred from the Charles Street garage. These men will be under the direction of the paint shop foreman. They will continue to use the spray method and, for the present, will remain on the old basis of two buses per week. The plans of reorganization have been made to include the possibility of painting both cars and buses in the paint shop by the spray method. The advantages of such an arrangement have led the officials of the maintenance department to study this possibility carefully. The peak of the car painting schedule occurs during the summer, while the peak of the bus painting schedule occurs in winter.

An important change in the reorganization will be the transfer of about $40,000 of bus material from the storeroom at Charles Street garage to the central stockroom at Carroll Park. At present, alterations in the method of storing are being planned to care for added material. More than $700,000 worth of railway material, comprising 25,000 different items, is now stored in the stockroom. With the inclusion of the bus material, the number of items will run up to about 32,000.

STORES ALSO CENTRALIZED

As a result of this concentration of all material at the central stockroom, two men will be able to handle the supplies which were handled in the garages by four men. Ultimately, the garages will keep only enough material in stock to meet the needs from day to day. Requisitioned material will be delivered daily from the central stockroom by truck, as is done for the carhouses.



Maintenance personnel at main shops has been increased to 375 by addition of bus department

GARAGE PERSONNEL REDUCED

The four garages will continue as storage and service stations and as operating centers for the buses. Of the 66 mechanics and mechanics' helpers comprising the total maintenance personnel, nineteen men and one foreman who did all the major overhaul work, and two painters will be transferred to Carroll Park. These transfers will reduce the personnel at each garage to a skeleton crew in charge of a foreman, which will perform the work of servicing, cleaning, gassing, light overhauls, periodic inspections, hauling and answering road calls. The garages will thus be given the same status as carhouses.

A maintenance crew of 21 men will remain at the Charles Street garage where 24 buses, of which twelve are double-deck buses, and twenty passenger cars of the railway company are stored. The spray painting outfit and the machine tool equipment formerly used for specialized engine overhaul at this garage, will be transferred to Carroll Park. A washrack and a brake tester will remain for the regular service work.

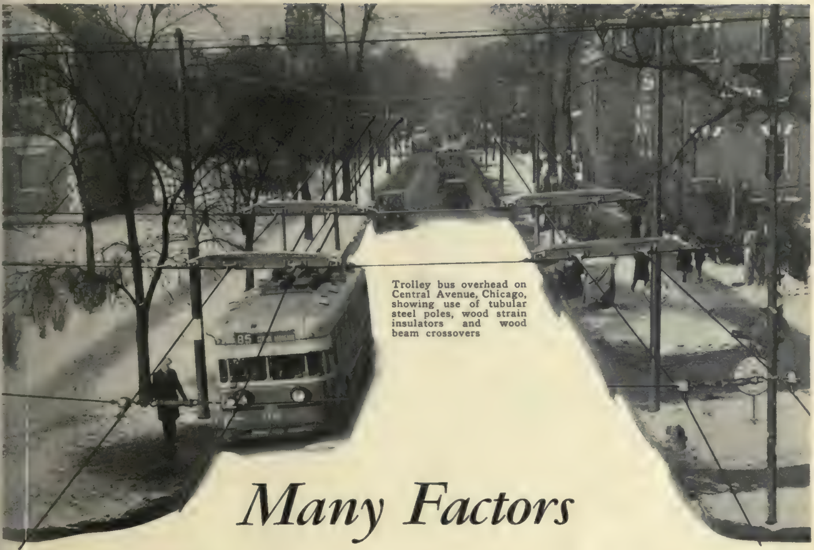
The maintenance crew at Fleet Street will be reduced from 25 to 15 men. Those who had been working on car body repairs and upholstery have been transferred to the railway mill shop. It is planned to have the repair and rebuilding of storage batteries for buses, which was previously done here, absorbed by the railway battery shop, which has a larger personnel and better facilities. The men assigned to chassis repair will also be transferred to the new bus repair shop. The remaining fifteen men will form the regular crew to service the 41 buses housed at Fleet Street.

The Druid Hill Avenue garage, where 29 buses and 25 snow plows are stored, will have a crew of twenty men with a foreman in charge. No reduction is planned in the personnel of the two day mechanics and two night mechanics at the Cumberland Street garage. This garage serves as a trouble station for the railway company, servicing and storing 40 trucks belonging to several of the railway departments.

The Carroll Park shops are on a 39-acre tract of land situated in the southwestern part of the city and owned by the United Railways. All repair shops and the main storeroom of the railway company are housed in the main group of eight buildings which have a total floor space of 345,000 sq.ft. Besides the new bus repair shop, the buildings house the mill and cabinet shop, car erecting shop, motor erecting shop, machine shop, paint shop, storeroom and offices of the superintendent of rolling stock and shops. Adjacent to the main group of buildings are located a concrete pole plant, a heating plant, a sand drying plant, an oil house, and 12,500 ft. of straight track, as well as storage track for 30 cars of the Washington Boulevard line.

Part of the Charles Street garage where all double-deck buses are stored

Some idea of the size and variety of maintenance work carried on at the shops may be obtained from the accompanying organization chart. The shops are well equipped and at the present time have a total maintenance personnel of 351 men and women. During 1930, 1,543 cars were repaired for damages, 900 cars received a general overhaul and 400 were painted. Every passenger car is put through a general overhaul about once a year, when it is sent to the shops for rewheeling. On this basis, the average car was rewheeled every 25,000 miles in 1930. The paint shop building is adjacent and similar in construction to the shop building newly assigned to bus repairs. It has seven tracks with a capacity of 50 cars. All cars are painted by hand, five days being required to put one through. The full capacity of the paint shop at present is 50 cars per month. The operating cars are stored and serviced at fifteen carhouses, which have a total personnel of 330 repair men and cleaners. The servicing at these carhouses includes oiling and greasing, renewal of brake shoes, control repairs and adjustments.



Trolley bus overhead on Central Avenue, Chicago, showing use of tubular steel poles, wood strain insulators and wood beam crossovers

Many Factors Affect Cost of TROLLEY BUS OVERHEAD

New current collection problems have arisen in connection with the development of the modern trolley bus system, resulting in several new devices, various types of construction and a number of unusual installations

By

L. W. BIRCH

Engineer Transportation Department
Ohio Brass Company

REMARKABLE advances in trolley bus overhead have been made since the vehicle had its first period of popularity in 1921. Although several of the early trolley bus installations deviated from the standard street railway overhead construction, the majority utilized railway materials because no others were obtainable. But new ventures require new devices, and so it has been with the trolley bus. The first wave of interest which passed over this country from 1921 to 1924 was so brief that it did not permit of exhaustive studies to be made of this means of transportation, and it rather fell by the wayside for lack of development. Installations made in 1928, 1929 and 1930, however, have completely revolutionized the system.

In planning a new trolley bus system, two major first costs must be considered, the purchase of vehicles and the construction of an overhead system. During 1930 the unit vehicle cost varied between $10,000 and $13,960, with the average for all purchased at $13,190. This element of cost is largely independent of local conditions. The overhead installation costs, however, are entirely dependent upon conditions on the particular property. Width of streets, location of buildings, trees, feeder facilities, schedules, grades, climatic conditions and many other factors influence the first cost of the overhead system. In an accompanying table are presented cost figures for three types of construction. The figures for materials are based on present costs, but the labor figures will vary somewhat throughout the country. Reference to accompanying Diagrams Nos. 1, 2 and 3, showing the three types of construction will indicate where the various materials are used. The cost figures, per mile of tangent overhead, are given for both one-way and two-way in the case of the span constructions and for one-way in the case of bracket arm construction. Pole spacings of 100 ft. are assumed in the calculations.

Factors Influencing Design

The trolley bus overhead differs from the usual street railway design in that the negative return is carried in the overhead system rather than in the running rail For years this method of feeding has been common to industrial haulage and the city lines of Cincinnati and Havana. The collection and insulation problems incident to two-wire overhead were solved long before the introduction of the trolley bus, but the swivel harp, the most approved type of current collector for the new vehicle, has introduced many new problems.

Almost all of the 129 trolley buses installed since September, 1929, at Salt Lake City, New Orleans, Chicago, Knoxville, Detroit, Brooklyn and Rockford, have been equipped with two 50-hp. motors. Under ordinary conditions of feeding, a No. 00 contact wire will furnish ample contact for good collection and sufficient conductivity. With the exception of Chicago, which has No. 000 wire, and a short section of No. 0000 wire at Knoxville, all of these modern installations use No. 00 round wire.

The selection of the type of contact wire is dependent upon the character of service. The problem is similar to other overhead contact wire problems. However, it must be kept in mind that the swivel harp is guided entirely by the contact wire and any sudden deviation from normal wire alignment may cause dewirements. For instance, slack contact wire, with its accompanying deep sag and side sway, often produces dewirements. In selecting wire, this fact must be borne in mind.

The choice of contact wires lies between hard-drawn copper and the bronze wires of varying conductivities. There are important factors to be considered in this connection. Conductivity with respect to an auxiliary feeder may be a decisive point. Perhaps the line is reconditioned street railway overhead and the supporting poles are near their load point. In that event, it is important to remember that hard-drawn copper contact wire has greater conductivity than bronze and may be sufficient feeder in itself, while the latter might require an auxiliary feeder.

From the standpoint of service life, hard drawn copper contact wire is entirely satisfactory under many conditions. Rochester, after seven years of trolley bus operation with No. 00 round wire of this composition, reports no perceptible wear. Because of the long life of hard-drawn copper contact wire, and important factor frequently is overlooked. After several years extreme sags are likely to develop unless retensioning is a part of the regular maintenance program. This is due to the fact that copper contact wire has no definite yield point, and is continually stretching, a fault which is rather serious with the swivel harp. The bronze contact wires have higher tensile strength and a more definite yield point permitting higher stringing tensions and little sag. This condition aids the action of the swivel harp. Chicago uses bronze contact wires throughout its present 17 route-miles of two-way overhead. The other recent installations are chiefly hard-drawn copper.

Designs for Tangent Construction

Tangent trolley bus overhead is generally similar on the various properties. The materials employed are mostly those manufactured and used for street railway overhead. The location and use of these for trolley bus overhead have been standardized through the co-ordination of operators and subcommittee No. 7 of the

Cost per Mile for Three Types of Tangent Trolley Bus Overhead, 100-ft. Pole Spacings

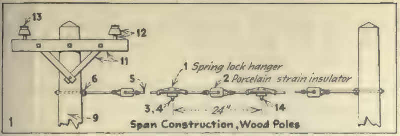
COST OF MATERIALS

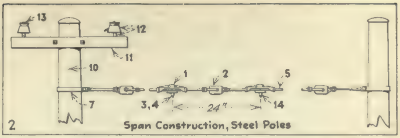
Item Number (See diagrams)	Quantity		Material	Span Construction—Wood Poles		Span Construction—Steel Poles		Bracket Arm Construction
	One-Way	Two-Way		One-Way	Two-Way	One-Way	Two-Way	One-Way
1	106	212	Spring lock hangers	$95	$190	$95	$190	$95
2	106	212	Porcelain strain insulators	23	46	23	46	......
2	159	......	Porcelain strain insulators	......	......	......	......	35
3	96	192	Trolley ears, 15-in., No. 00	53	105	53	105	53
4	10	20	Feeder ears, 15-in., No. 00	9	18	9	18	9
5	4,000 ft.	4,000 ft.	Steel strand, extra galv., $\frac{5}{16}$ in. reg. grade	52	52	52	52	......
5	800 ft.	......	Steel strand, extra galv., $\frac{5}{16}$ in. reg. grade	......	......	......	......	10
6	106	106	Eye bolts, $\frac{5}{8}$ in. x 16 in., galv	27	27	......	......	......
7	106 sets	106 sets	Pole bands, supports, etc	......	......	100	100	......
8	53	......	Bracket arms, complete, 12 ft	......	......	......	......	434
9	106	106	Wood poles, 30 ft., creosoted	1,484	1,484	......	......	......
9	53	......	Wood poles, 30 ft., creosoted	......	......	......	......	742
10	106	106	Steel poles, 30 ft., 5-6-7	......	......	3,657	3,657	......
11	53 sets	53 sets	Crossarms, braces, screws and bolts	59	59	42	42	60
12	106	106	Feeder wire insulators and pins	23	23	23	23	23
13	2 mi.	2 mi.	Feeder wire, No. 0000, stranded weatherproof	1,034	1,034	1,034	1,034	1,034
14	2 mi.	4 mi.	Trolley wire, No. 00, round	518	1,036	518	1,036	518
Total for materials				$3,377	$4,074	$5,606	$6,303	$3,013

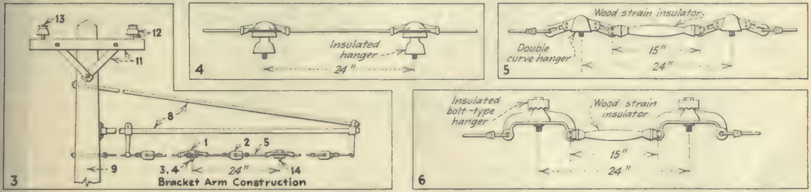
COST OF LABOR AND MISCELLANEOUS ITEMS

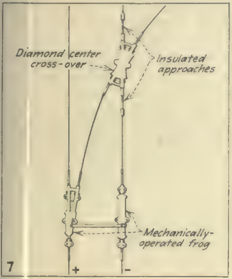
Hauling, handling and setting poles	$848	$848	$1,272	$1,272	$424
Installing spans or bracket arms, insulators, hangers and trolley wire	600	800	600	800	400
Installing crossarms, pins, insulators and feeder wire	500	500	500	500	500
Trucks, overhead and miscellaneous	1,000	1,200	1,000	1,200	1,000
Total for labor and miscellaneous	$2,948	$3,348	$3,372	$3,772	$2,324
Total cost per mile for construction	$6,325	$7,422	$8,978	$10,075	$5,337

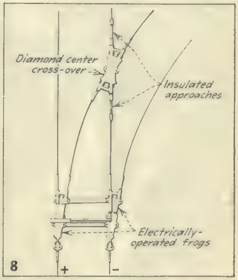
If 500,000 circ. mil feeder is substituted for No. 0000, add $1,500; if 1,000,000 circ. mil is substituted, add $3,800.











Diagrams 1, 2 and 3—Three types of overhead construction, widely used in trolley bus installations. Small numbers refer to parts listed in the accompanying table

Diagram 4—An insulated hanger is used in this tangent construction

Diagrams 5 and 6—Two curve designs, one using double-curve hangers and the other, insulated bolt hangers

Diagram 7—Mechanically operated frog, for use at turnouts where the trolley buses all follow one path

Diagram 8—Where trolley buses must select one of two routes at a turnout, an electrically operated frog is desirable

A.E.R.E.A. power distribution committee, 1923. This committee made an exhaustive study of the subject, its efforts being rewarded by the standardization of many overhead parts and practices concerning mechanical clearances, and separation between contact wires (of 24 in.).

Since 1928 tangent overhead has been similar to one of two recommended designs, the more common type shown in Diagram 1, using two round-top hangers, insulated intermediately by a porcelain strain or a wood stick insulator inserted in the span wire between the hangers. With a potential difference of 600 volts direct current separated by only 24 in., and insulated with standard composition hangers, the intermediate insulation has been found necessary. In the second type, as used at Detroit, the intermediate insulation is attached directly to the hanger stud. This arrangement, Diagram 4, permits of greater flexibility in the adjustment of the overhead system than where the intermediate insulation is "served" in the span wire. A standard type of mine or barn hanger acts as the supplementary insulation in this instance.

It is common practice on two-way installations to make the two inside contact wires positive and the two outside wires negative. With this type of construction no intermediate insulation is required between the two positive contact wires. However, a strain insulator is advisable between the outside negative wires and the poles. In the event of a mechanical or electrical breakdown, this insulation often prevents the pole from being charged positively.

The type of insulator used for intermediate or span insulation may correspond to the standard types used by the railway. At present most companies are insulating span wires with porcelain strain insulators. However, the number of wood stick insulators used by electric railways is still large. The wood stick insulator is convenient in that various types of end fittings are available for attachment to overhead materials or steel pole bands. The wood stick insulator can be made any length, an advantage because the leakage surface can be extended. The porcelain insulator probably has the greater life owing to its composition and its resistance to burning during leakage.

Two forms of curve construction used on recent installations are shown in Diagrams 5 and 6, the first being the more common. This type of curve uses a round-top composition double-curve hanger with separable arms, the arms being designed to permit ear replacement without disconnecting the arms from the hanger body. In Diagram 6, the insulated bolt type of double-curve hanger is used. Both types of insulation are to be found in Chicago, while modifications of that shown in Diagram 5 are to be found at Salt Lake City, Knoxville and Detroit. The insulation between positive and negative hangers for curve construction is usually of wood. The wood stick insulator, manufactured to a definite length, can be readily inserted between the eyes of the double-curve hangers and will maintain a definite spacing between positive and negative wires at all times.

Trolley bus operation has required several types of turnouts heretofore not considered. Some of these are necessary for straight trolley bus operation, and others for joint operation with street railway overhead. Where a trolley bus is operating in one direction at all times at a turnout point and the street car is operating through the main line or the turnout, a mechanically operated frog, operated from a tripping device in the negative wire, can be used. A frog of this type is shown in Diagram 7. The trolley bus harp is the only harp operating on the negative wire, so that the tripping device is not actuated by any other vehicle.

Where trolley bus operation is over both main line and turnout at an intersecting point, the mechanical frog cannot be used. In this situation, the direction of travel or the setting of the frog tongues is accomplished most satisfactorily with an electrically-operated mechanism attached to the frog pan. In Diagram 8, the frog is set by the operator of the trolley bus through the position of his controller.

Two types of crossovers have been designed for trolley bus overhead construction. The heavy wood beam type has been used to a great extent for 90 deg. crossings. For angular crossings a combination of standard diamond center live rigid crossover and insulated approach has been used in Salt Lake City, Knoxville, Chicago, Brooklyn and Detroit, and has been satisfactory from the standpoint of alignment and weight. This arrangement is simple and minimizes the number of special crossovers and parts which must necessarily be kept in stock for maintenance. The insulated approach and the live rigid crossovers are attached directly to each other, no contact wire existing between the two devices.

There are two methods of turning a trolley bus, the loop and the wye. The loop method is probably the more satisfactory because it eliminates the hazard incident to traffic lanes. A loop does not require special materials other than those necessary for curve construction. A wye necessitates the use of crossovers and special spring frogs.

Load Conditions Determine Feeder Requirements

Trolley bus overhead requires both negative and positive feeders. The amount of feeder for either line is entirely dependent upon load conditions, and must be determined by the operating company, which has a record of vehicle movements and load demands. A careful check of requirements should be made before installing positive and negative feeders. Frequently, after a trolley bus system has replaced a car line the rail is allowed to remain in the streets. This rail may be used for negative return.

There are several ways of feeding the contact wires, the most common and convenient being that used by Detroit and Knoxville. Alternate cross feeder spans are of the same polarity and tap contact wires of the same polarity. Connections from the cross feeder span to the contact wires are made with a flexible jumper and feeder ear.

Several of the present trolley bus installations have replaced street car lines. In these instances the street railway overhead system was reconditioned to satisfy trolley bus conditions. The addition of two extra contact wires, where two-way trolley bus operation is replacing double-track street car operation, places greater load on the span wires and, as a consequence, on the supporting poles. In some cities additional poles or heavier poles have been necessary. However, in many places the existing poles have been used, sometimes having been reinforced at the base.

Warning Signals on Public Service Cars and Buses

As an additional safety precaution, signaling devices which indicate when, and in what direction, a trolley car or bus is about to turn, are being installed on all cars and buses of Public Service Co-ordinated Transport. The signals will cost more than $50,000.

Every bus will be equipped with signals, mounted on each side of the bus at the front. When the bus is about to turn, the operator presses a button causing a warning signal arm to rise to a horizontal position on the right or left side of the bus, depending upon the direction in which the turn is to be made. The signal arm is constructed of a red transparent material and contains a bright electric light which makes the signal clearly visible at night. The arm is operated by vacuum pressure from the bus motor. The signals to be installed on street cars follow the same general design except that operation will be by hand. As a reminder to the drivers of other vehicles to obey the law regarding the passing of standing street cars, and so afford greater protection to trolley patrons, the words "Obey the Law" and "Look Out For Stops" will be painted on the rear panels of all Public Service street cars.

Signals mounted at the front of Public Service cars and buses show when the vehicle is about to make a turn. The signal arm carries an electric light to make it visible at night

Modernized Snow Fighting Methods *Effective in Chicago*

Chicago's recent heavy snowfall was combatted so successfully that service was maintained on all lines

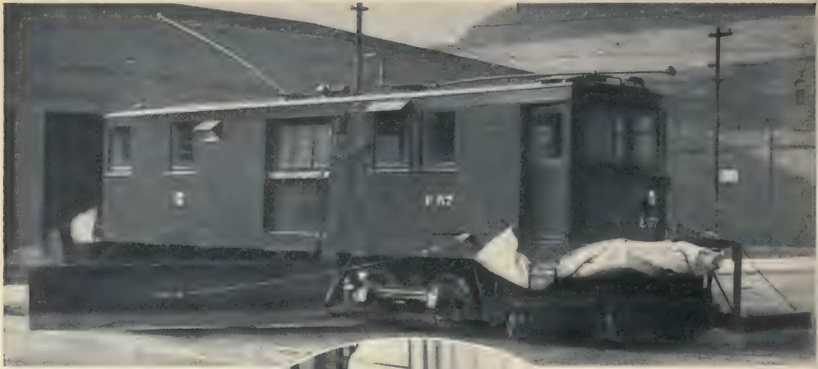
SINCE the new traction ordinance was approved by the voters of Chicago last summer, the shops and equipment department of the Surface Lines has carried out an extensive program of modernization of its snow-fighting equipment. In addition to purchasing three new large double-truck sweepers, improvements were made to sixteen plows and 40 sweepers by adding air-operated wings and new type brooms. In conjunction with these mechanical changes, snow emergency operations were completely reorganized to obtain a greater efficiency from the use of the improved equipment.

That the money and effort devoted to this rehabilitation and reorganization were fully warranted was demonstrated during the blizzard which struck Chicago on Saturday, March 7. This storm was probably the second most severe in the history of the city and was the worst from the standpoint of concentrated snowfall. It seriously threatened the disruption of all transportation facilities. Thirteen inches of snow fell between 10 a.m. and 7 p.m., and the snowfall then continued more slowly until a total of 16 in. had fallen. A high wind, which accompanied the storm, caused heavy drifting throughout the city. An additional emergency was created because of the large number of automobiles which came into the central business district before the storm broke and which impeded railway service on their return to the outlying sections during the afternoon when the storm was at its height. The Surface Lines, however, was prepared, and with its new and improved equipment and its fully co-ordinated program of operations, maintained constant service on all trunk lines and opened the entire system with minimum delay.

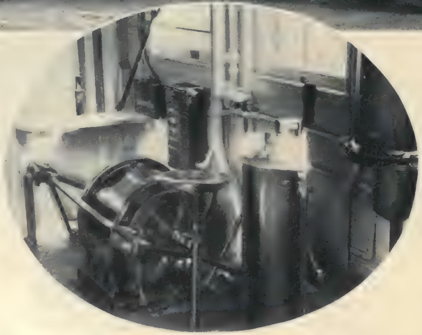
Surface Lines has spent approximately $100,000 for improvements and additions to its snow equipment during past year. Operations completely revised and thoroughly co-ordinated. Efficiency proved during recent storm

The three new sweepers purchased are equipped with four 50-hp. motors of the G.E.-80 type for propulsion and with two G.E.-800 type motors for driving the brooms. The brooms are bevel-gear driven. These sweepers are also equipped with 14-ft. side wings, air-operated so that they can clean a 12-ft. strip outside of the track gage line, as well as the track itself. The wing is raised or lowered with a 10x12-in. cylinder and is pulled by an 18x12-in. cylinder, both mounted inside the cab. A devil-strip cleaner is also provided as shown in an accompanying illustration. The bodies and broom driving mechanisms were purchased from the Russell Snow Plow Company, and the trucks, motors and air-brake equipment were taken from the reserve supply of the Chicago Surface Lines.

Five snow plows were built from old sprinklers which



One of the new double-truck sweepers purchased by the Chicago Surface Lines



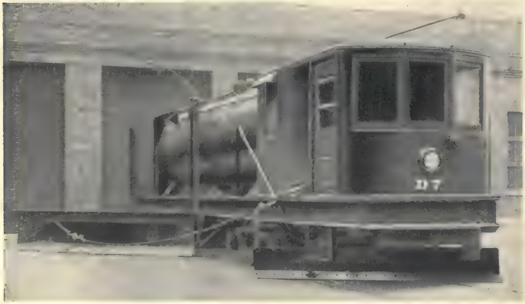
The illustration at the left shows a wing-operating equipment on one of the new sweepers

were available. They are equipped with four 50-hp. motors. The old sprinkler frame was extended with 13-in. channels, and reinforced with truss rods. New 14-ft. side wings were provided and arranged for air operation. These wings are also raised or lowered with a 10x12-in. cylinder, and pulled by an 18x12-in. cylinder mounted inside the cab. The plow is provided with a 12-ft. shear which is dragged and is raised or lowered by an air cylinder inside the cab. Provision is also made through this cylinder for increasing the pressure on the shear by admitting air to the top of the cylinder. A 10-in. cylinder is used so that additional pressure of 4,700 lb. may be obtained. The shear itself weighs approximately 1,000 lb. These vehicles are capable of clearing the track and a 12-ft. strip adjacent to the track gage line at a speed sufficiently high to maintain their place in regular traffic. With the air-operated shear and wing facilities, they may be used throughout the 24 hours of the day.

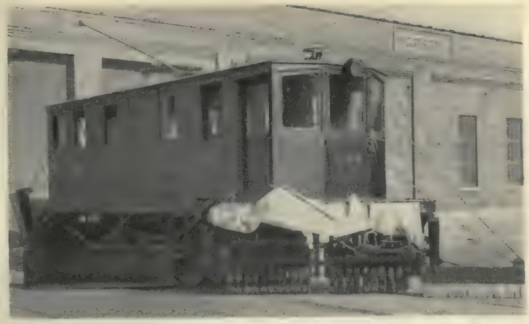
Improvement made to 40 single-truck sweepers, consisted of the addition of air-operated 8-ft. side wings and a devil-strip cleaner. These sweepers are equipped with two GE-80 type motors for propulsion and one GE-800 type motor for driving the brooms. A 10x12-in. brake cylinder is used for operating the wing on the side. This wing is raised or lowered by hand from the inside of the cab. Twenty of these sweepers were also equipped with an improved-style broom so designed that the renewal of the broom can be made more quickly and cheaper than with the old style.

With this new and reconstructed equipment, the fleet of snow-fighting vehicles for use on street railway lines now consists of 291 units, of which 104 are sweepers, 26 are heavy-duty plows with 14 ft. wings, 138 are lighter plows, ten are work cars, equipped with plow shears, and thirteen are work cars provided with large wings.

In addition, ten heavy motor trucks have been equipped with large shear plows for work on trolley bus and gasoline bus routes. Three sanding units are also used in conjunction with the plows. It is a point of un-



Sprinkler car converted into heavy-duty snow plow with wing and shear blades



Single-truck sweeper showing 8 ft. wing, new style broom and devil strip cleaner

usual interest to note, that, during the recent storm, the trolley buses at no time faltered in their operation. Almost 100 per cent service was maintained on these lines, reliefs were made on time and receipts remained normal.

A novel apparatus, called a snow gage, plays a definite and important part in predetermining the probable demands to be made on the snow-removal equipment. At three extreme points of the system, south, west, and north, snow gages are installed on carhouse roofs. Half-hourly readings are taken from these instruments which determine the amount of snow and the rate of fall per hour. These readings, together with the reading of the barometer and the direction and velocity of the wind, furnish a scientific calculation on which to base an accurate judgment of the severity of the storm. The snow melts in the gage and is measured in a glass tube. By ascertaining the snow equivalent of the water in the tube, it is easy to calculate the exact depth of the snow-fall.

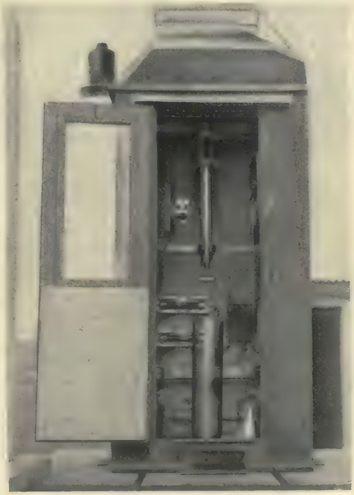
Snow Equipment Redistributed

Coincident with the general rehabilitation of equipment program, an equally important reorganization of snow-fighting operations was made. A reassignment of snow-work vehicles was made to the various carhouses and specific work was planned for each unit. On the Surface Lines system there are approximately 1,000 miles of single track to be cleaned during snow-storms. No "dead track" is swept during storms with the exception of that in the "loop" and immediate environment. All efforts are confined to keeping service tracks open. Dead track is used only in an emergency and is more difficult to clean while a storm is in progress than is service track with cars operating over it. However, it is cleaned after the storm is over. There are also about 95 miles of single track on lines of minor importance. Long headways are operated on these routes and consequently the track is quite difficult to hold open during a storm. Heretofore, sweepers were used and they encountered much difficulty and lost considerable time, during all of which they were away from more important lines. Instead of sweepers, small plows without side-wings, or specially constructed cars fitted with air-operated scrapers are now used.

The remaining trackage is divided up into 89 sections, all of which are substantially equal and average slightly in excess of 10 miles of single track in length. A sweeper is assigned to each of these sections. Each sweeper is, therefore, given an equal amount of work to do. Under the former system, some units had as many as 14 or as few as 7 miles of single track to keep open. Such discrepancies were unavoidable under the old method of allocation where one sweeper more or less would distort the balance in terms of mileage per unit.

The new routine of sweepers has eliminated nearly 30 miles of single track that was formerly swept by units from different divisions clearing sections used in common with other lines. Some duplicate mileage still remains but only because it cannot be eliminated due to lack of track special work. This feature of the new plan, together with the use of plows and scraper cars on small unimportant lines, has practically the same effect as the addition of twelve units to the existing fleet of sweepers. The central district, or loop, has never had a sweeper assigned to it. Much of the track in this area was not cleaned by any sweeper traveling along its regular route and it was necessary to "steal" one and keep it long enough to go over the unassigned trackage. Under the revised plan a sweeper from Kedzie depot reports to the loop area and is routed to cover all tracks not cleaned by other sweepers.

Because of the improbability that all of the sweepers will remain in operating condition all of the time during the storm, the new snow schedule is so constructed that 89 sweepers will be used regularly on specific routes



Gage determining depth and rate of snowfall while the twelve remaining are unassigned and are considered as spare units. One is located at each of the twelve divisions. These spare units guarantee a sweeper for service on every regular route since it is possible to replace one that becomes disabled. In the past when such a condition arose another sweeper had to double up or a drag plow was substituted and in either case results were not satisfactory. The spare unit, although located at a particular division, is available for service anywhere. If a sweeper has to be taken off its route for any reason, its place is filled by any one of several others operating on connecting routes. In turn, this route is filled by subsequent move-ups. This procedure is carried out until a vacancy has been transferred to any route connecting directly with a depot at which a spare is available. The spare sweeper then goes into service on this last route. The flexibility of this method of sweeper operation is obvious and little or no difficulty is presented by the relative location of the disabled sweeper and the spare that will replace it. The move-up can be made in any direction with equal ease. A record of all spare units in service or available is kept by the general office. When the moving up of the routes involves more than one depot, as is often the case, the different depots are given definite instructions on whatever manipulation of sweepers is necessary. To permit the dispatching of sweepers from one route to another with speed and accuracy, it is necessary to know all connecting routes and depots out of which they are operated. A chart giving this information has been devised.

Plows clearing snow from trolley bus routes

Maps Show Location of Equipment

All depots receive periodic information pertaining to the location and direction of sweepers in order that any necessary orders can be promptly carried out. A one-line map showing all the routes operated by each division has been made up. This map shows all routes and small targets are supplied to represent the sweepers. By moving the targets in accordance with reports received from sweeper crews working along the different routes the targets keep a complete record of time, place and direction of any piece of equipment.

All winging back of snow is done by 26 heavy-duty plows. Every mile of track on the system is covered including those small and unimportant sections not cleared by sweepers. Each unit is required to take care of between 35 and 40 miles of single track, and is able to go over its route in about 3½ or 4 hours. The wings of these plows are air-operated and since this facilitates their handling, the speed of plows can equal and, in some cases, exceed the passenger schedule. They can, therefore, be sent out at any time without fear of distorting passenger car service. Many heavy-duty plows have either hand or air-operated shears attached. At the beginning of a storm the shears are brought into service to aid sweepers before plows become necessary. Use of these units for this purpose is secondary to their principal function, and care is taken not to let these equipments get out of bounds of a prompt recall.

Since plow routes are approximately four times as long as sweeper routes, and no spare units are available, it is important that they be operated by the best men available. Each depot has, therefore, selected two sets of men, one to relieve the other. These men have been especially well schooled in the operation of the unit and the work it has to do. Classes in the use of snow equipment were conducted at all of the depots. The use of sweepers, plows and work cars was explained and the operation demonstrated. Considerable interest was manifested and approximately 8,000 men were in attendance. While many of these will never be called on for snow work or are unsuited for it, the knowledge acquired of the important task is quite valuable. All depots have prepared a list of those who are key-men in the operation of snow equipment and they have all been instructed to call into the depot at the beginning and during storms to find out if they are needed. This simplifies and accelerates the organization of the snow-fighting forces and enables a speedy dispatch of equipment manned by competent and loyal men.

Because sweepers are sometimes disabled due to thoughtlessness on the part of the crews, "reminders" advising and calling attention to certain items have been made up and are conspicuously posted in all sweepers. It is confidently expected that equipment failures due to avoidable abuse will be materially decreased as a result and better operating efficiency can be expected. Disabled sweepers are costly when needed and any steps that can be taken to guarantee continuous operation are well worth while.

A plan of street supervision for the movement of passenger cars has been developed more effectively to break up long headways. Men are stationed at advantageous points along all lines and their principal duty is to break up blockades of cars and switch them to cut the headway to normal. The normal force of supervisors and starters is increased by about 100 men during a snowstorm. All depots share this load and each has been given a list of locations at which it will station them. The city is divided into four general supervision areas. Each area is covered by a man having the necessary authority to issue orders to trainmen and who sees to it that the snow program as laid down is carried out. He is held responsible for the performance of all divisional authorities in his particular section and keeps in constant communication with the general office. With this system the general office has a check of all activities.

Electric Railways CARRY ON *in a Year Beset with Difficulties*

Operating economies obtained in 1930 offset in large measure the decreased revenues that were general. Reports from 75 companies operating transportation lines in the United States and other countries are analyzed to give significant statistics

CONSIDERING the acute difficulties under which the electric railway systems were forced to operate throughout last year they rendered a good account of themselves. This will be seen from a study of the annual statements, which now are becoming available in considerable number. The reports which are published in this article are those of companies operating transportation systems exclusively, or else the transportation departments of those larger utility properties which segregate their accounts.

Gross revenues were reduced on more than 90 per cent of the properties from which reports were received. The reductions vary over a considerable range. On the whole, revenue was off some 6 per cent from the preceding year. This result compares favorably with the returns of manufacturing and industrial companies, in which the shrinkage of business has been far greater. Restriction of earnings in past years makes the loss of transportation business more serious, however, than in an industry where profits are not limited.

In view of the reduction in revenue it was found possible to curtail expenses practically in proportion, so that the net operating revenue of many of the companies held up fairly well. In total amount, however, the net was down on 64 of the 75 properties. Fixed charges and taxes showed comparatively little change from 1929, so that the result of the year's operations was a reduction in net revenue on many of them.

Table I—Significant Changes in Operation, 1929-1930, Classified According to Size of Properties

	Annual Gross Revenue			
	Less Than $1,000,000	$1,000,000 to $10,000,000	More Than $10,000,000	Total
Total number of companies:	12	41	12	65
Gross revenue:				
Increased in 1930	2	4	0	6
Decreased in 1930	10	37	12	59
Operating expenses:				
Increased in 1930	[illegible]	6	0	8
Decreased in 1930	10	35	12	57
Operating revenue:				
Increased in 1930	3	5	1	9
Decreased in 1930	9	36	11	56
Net income:				
Increased in 1930	4	9	1	14
Decreased in 1930	6	28	10	44
Figures not available	2	4	1	7

This year reports from 75 properties in the United States and Canada which operate electric railway or combined railway and bus transportation systems exclusively, have been abstracted. For comparative purposes they have been put into a standardized form similar to that used last year, and are presented in Table III. These reports are from companies widely distributed all over the country, representing more than half the states of the Union and including Canada. Accordingly, they give a good general picture of the status of the industry in America. While many more reports will become available within the next few months, it has been found in previous years that they follow the same general trend. The greater portion of the companies included in the analysis are the same ones whose reports for 1929 appeared in the article published in April, 1930. Of the 75 reports published, only the first 65 were included in the analysis, since the others cover foreign properties or were received too late for inclusion.

Table II—Range of Operating Ratios in 1930, Arranged According to Size of Properties

	Annual Gross Revenue			
	Less Than $1,000,000	$1,000,000 to $10,000,000	More Than $10,000,000	Total
Total number of companies..	12	41	12	65
Range of operating ratios:				
Above 1.00	1	2	0	3
0.90-1.00	1	2	0	3
0.80-0.90	0	7	3	10
0.70-0.80	1	10	6	17
Below 0.70	3	7	3	13
Figures not available	6	13	0	19

In size the properties under consideration range from those with gross revenues of a few hundred thousand dollars up to more than sixty millions. For purposes of comparison they have been grouped in Tables I and II into three classifications according to size. The first group includes companies having less than $1,000,000 annual gross revenue, the second between $1,000,000 and $10,000,000, and the third includes companies with revenues greater than $10,000,000. The group of medium-sized properties consists of 41 companies and the other groups twelve each.

Comparison of the results of operation on these properties for 1930 as contrast with the previous year is shown in condensed form in Table I. Gross revenues were down on all but six of the properties. This is in sharp contrast with the results published a year ago, when exactly half of the 60 companies analyzed showed a gain in gross. However, most of the managements have been able to adjust their operations according to

Table III—Condensed Financial Reports of Electric Railway Properties, 1930-1929

All Figures are in Dollars

	Fresno Traction Co., Fresno, Cal.		**Los Angeles Railway, Los Angeles, Cal.**		**Motor Transit Co.,[11] Los Angeles, Cal.**		**Sacramento Northern Ry., Sacramento, Cal.**		**Market Street Ry., San Francisco, Cal.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	267,262	286,688	13,732,651	14,874,309	1,135,450	1,265,004	2,083,308	2,104,366	9,196,340	9,590,193
Railway operating expenses	270,773	279,667	11,138,138	11,222,861	1,148,282	1,194,671	2,369,046	2,051,670	7,842,745[1]	8,064,477
Net revenue, railway oper	*3,511*	7,020	2,594,513	3,651,448	*12,831*	70,332	*285,738*	52,696	....	....
Taxes	16,729	17,956	953,714	997,391	54,574	61,088	122,103	130,493	....	....
Operating income	*20,240*	*10,935*	1,640,799	2,654,056	*67,406*	9,245	*407,841*	*77,797*	1,353,595	1,525,716
Non-operating income	....	....	213,050	190,251	83,785	229.555	61,216	78,065	20,523	22,552
Gross income	*20,240*	*10,935*	1,853,849	2,844,307	16,378	238,800	*346.625*	268	1,374,118	1,548,267
Deduct. from gross income	....	....	1,508,098	1,547,666	81,954	253,103	501,176	426,342	653,881	710,754
Net income	....	....	345,751	1,296,641	*65,575*	*14,303*	*847,801*	*426,074*	720,237	837,513
Operating ratio	1.013	0.955	0.811	0.754	1.011	0.944	1.137	0.975	....	....

	Municipal Railway, San Francisco, Cal.		**Northwestern Pacific R.R., Sausalito, Cal.**		**Tidewater Southern Ry., Stockton, Cal.**		**Denver Tramway, Denver, Colo.**		**Capital Traction Co., Washington, D. C.**	
	1930[2]	1929[2]	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	3,574,463	3,499,703	5,555,533	6.186,763	448,171	308,854	3,987,772	4,214,298	4,164,521	4,296,906
Railway operating expenses	3,209,157	3,118,241	5,072,599	5,384,887	359,231[1]	305,326[1]	2,739,959	2,902,564	3,006,014	3,067,371
Net revenue, railway oper.	365,305	381.461	482,934	801,876	....	....	1,247,813	1,311,734	1,158,507	1,229,535
Taxes	370,631[5]	350,877[5]	433,754	449,434	....	....	485,191	494,201	324,652	327,592
Operating income	*5.325*	30,584	48,801	351,993	88,940	3,528	762,621	817,533	833,855	901,943
Non-operating income	34,319	31,849	....	....	9,571	10,440	45,969	46,888	24,494	26,869
Gross income	28,994	62,433	....	....	98,512	13,968	808,592	864,421	858,349	928,912
Deduct. from gross income	493,979[6]	494,305[6]	....	....	35,797	24,817	497,040	513,283	369,049	366,938
Net income	*464,985*	*431,871*	....	....	62,714	*10,849*	311,551	351,138	489,340	561,974
Operating ratio	0.898	0.890	0.901	0.870	....	....	0.682	0.688	0.722	0.711

	Washington Ry. & Electric Co., Washington, D. C.		**Jacksonville Traction Co., Jacksonville, Fla.**		**Honolulu Rapid Transit Co., Honolulu, Hawaii**		**Chicago, North Shore & Milwaukee R.R., Chicago, Ill.**		**Chicago Rapid Transit Co., Chicago, Ill.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	5,638.415	5,798,648	1,031,276	1,141,139	1,047,822	1,063,168	6,672,508	8,020,762	19,624,045	21,106.490
Railway operating expenses	3,571,937	3,683,954	844,817	928,589	753,384	737,800	5,638,471	5,913,692	14,061,481	16,621,161[1]
Net revenue, railway oper.	2,066,478	2,114,694	186,459	212,550	294,437	325,368	1,034,037	2,107,070	5,562,564	......
Taxes	408,171	450,276	92,975	108,890	107,977	105,832	290,592	380,086	1,860,092	......
Operating income	1,658,308	1,664,378	93,482	103,658	186,460	219,535	786,516[9]	1,787,612[9]	3,702,471	4,485,330
Non-operating income	1,659,784	1,515,933	....	....	3,219	2,012	1,387,368	380,711	280,265	267,097
Gross income	3,318,092	3,180,312	87,423[7]	97,533[7]	189,679	221,547	2,173,885	2,168,323	3,982,737	4,752,427
Deduct. from gross income	1,353,683	1,405,118	150,627	157,953	5,848	6,600	1,576,030	1,445,258	3,774,874	3,682,948
Net income	1,964,409	1,775,194	*63,204*	*60,420*	183,830	214,947	597,855	723,065	207,862	1,069,479
Operating ratio	0.633	0.635	0.819	0.814	0.719	0.694	0.845	0.737	0.711	....

	Chicago Surface Lines, Chicago, Ill.		**Chicago & West Towns Ry., Oak Park, Ill.**		**Illinois Terminal Co., Springfield, Ill.**		**Gary Railways, Gary, Ind.**		**Chicago, South Shore & South Bend R.R., Michigan City, Ind.**	
	1931[15]	1930[15]	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	56,737,090	62,717,867	1,445,692	1,567,333	7,490,935	8,154,358	1,166,212	1,293,442	3,556,706	3,691,578
Railway operating expenses	43,890,943	46,015,703	1,098,857[1]	1,160,977[1]	5,198,237	5,651,739	897,247	987,434	2,859,780	2,884,739
Net revenue, railway oper.	12,846,147	16,702,164	....	....	2,292,698	2,502,619	268,964	306,008	696,926	806,838
Taxes	3,435,000	3,235,000	....	....	364,823	312,061	48,294	59,248	59,537	60,817
Operating income	9,411,147	13,467,164	346,835	406,356	1,927,747	2,190,425	220,670	246,759	637,388	746,021
Non-operating income	....	....	....	....	....	....	1,525	6,886	34,917	60,246
Gross income	....	....	346,835	406,356	....	....	157,860[16]	189,311[16]	591,580[16]	647,264[16]
Deduct. from gross income	....	....	177,369	177,368	....	....	90,169	118,295	284,839	227,974
Net income	....	....	169,467	228,988	....	....	67,690	71,015	306,740	419,290
Operating ratio	0.773	0.733	....	....	0.694	0.693	0.769	0.763	0.804	0.780

	Waterloo, Cedar Falls & Northern Ry., Waterloo, Iowa		**Louisville Railway, Louisville, Ky.**		**Androscoggin & Kennebec Ry., Lewiston, Maine**		**United Rys. & Electric Co., Baltimore, Md.**		**Boston Elevated Railway, Boston, Mass.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	1,079,153	1,307,921	4,561,757	4,820,901	716,520	784,548	16,160,513	16,717,100	32,406,398	34,007,696
Railway operating expenses	901,112	1,041,782	3,207,923	3,465,693	571,922	609,186	11,034,940	11,335,024	23,527,974	24,024,747
Net revenue, railway oper.	178,041	266,138	1,353,834	1,355,208	144,598	175,362	5,125,573	5,382,076	8,878,423	9,982,948
Taxes	39,384	39,500	469,500	461,000	20,379	20,487	1,557,004	1,635,733	1,686,950	1,619,962
Operating income	138,657	226,638	884,334	894,208	50,719[8]	79,718[8]	3,568,569	3,746,343	7,191,473	8,362,985
Non-operating income	4,390	3,230	46,575	89,666	....	....	132,025	175,591	104,322	88,926
Gross income	143,047	229,869	930,909	983,874	50,719	79,718	3,700,594	3,921,934	7,295,795	8,451,912
Deduct. from gross income	472,950	563,692	580,554	639,720	68,142	68,142	3,299,920	3,387,078	8,430,434	8,357,840
Net income	*329,902*	*333,823*	350,355	344,154	*17,423*	11,443	400,674	534,856	*1,134.638*	94,072
Operating ratio	0.821	0.796	0.703	0.718	0.798	0.776	0.683	0.678	0.726	0.7065

	Boston, Revere Beach & Lynn R.R., Boston, Mass.		**Eastern Mass. Street Ry., Boston, Mass.**		**Mass. Northeastern Street Ry., Haverhill, Mass.**		**Union Street Railway, New Bedford, Mass.**		**Middlesex & Boston Street Ry., Newtonville, Mass.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue	1,250,321	1,271,014	7,829,407	8,579,454	193,692	269,451	1,103,074	1,283,222	1,119,294	1,164,390
Railway operating expenses	980,889	1,002,418	6,241,131	6,358,655	152,476[1]	279,055[1]	1,037,507	1,120,118	933,033	969,603
Net revenue, railway oper.	269,432	268,596	1,588,276	2,220,799	....	....	65,567	163,104	186,260	194,787
Taxes	37.291	33,769	300,405	351,182	....	....	45,942	61,059	34,765	33,931
Operating income	232,141	234,827	1,287,871	1,869,617	41,216	*9,604*	19,625	102,044	151,495	160,856
Non-operating income	2,364	2,854	124,788	229,744	....	....	811	1,361	....	....
Gross income	234,506	237,682	1,412,659	2,099,361	41,216	*9,604*	20,436	103,404	151,495	160,856
Deduct. from gross income	143,349	147,161	975,787	1,098,658	55,930	56,130	21,721	16,180	144,334	156,366
Net income	91,156	90,520	436,871	1,000,703	*14,713*	*65,734*	*1,285*	87,223	7,161	4,489
Operating ratio	0.784	0.788	0.797	0.745	....	....	0.940	0.873	0.833	0.833

Table III—(Continued)—Condensed Financial Reports of Electric Railway Properties, 1930-1929

All Figures are in Dollars

	Berkshire Street Ry., Pittsfield, Mass.		Springfield Street Ry., Springfield, Mass.		Worcester Consolidated Street Ry., Worcester, Mass.		Dept. of Street Railways, Detroit, Mich.		Grand Rapids R.R., Grand Rapids, Mich.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue..	650,745	718,069	2,420,496	2,719,698	2,788,361	3,068,690	21,123,786	26,444,874	1,360,872	1,688,810
Railway operating expenses.	571,998[1]	634,330[1]	1,951,825[1]	2,220,309[1]	2,169,884[1]	2,429,675[1]	17,872,755	21,057,542	1,004,637	1,089,654
Net revenue, railway oper.	....	....	....	....	....	....	3,251,031	5,387,332	356,235	599,156
Taxes	....	....	....	....	....	....	774,563	750,948	108,516	131,248
Operating income........	78,747	83,739	468,671	499,387	618,477	639,015	2,476,468	4,636,383	247,719	467,907
Non-operating income......	5,049	3,010	....	....	....	....	119,802	118,396	....	....
Gross income	83,796	86,749	468,671	499,387	618,477	639,015	2,596,270	4,754,779	247,719	467,907
Deduct. from gross income	287,515	292,527	279,611	290,340	413,444	454,965	1,739,105	1,651,590	229,750	237,090
Net income	*203,719*	*205,778*	189,060	209,046	205,032	184,050	857,165	3,103,189	17,969	230,817
Operating ratio..........	....	....	....	....	....	....	0.846	0.796	0.738	0.645

	Twin City Rapid Transit Co., Minneapolis, Minn.		Kansas City Public Service Co., Kansas City, Mo.		St. Louis Public Service Co.,[17] St. Louis, Mo.		Omaha & Council Bluffs St. Ry., Omaha, Neb.		Public Service Co-ordinated Transport,[18] Newark, N. J.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue..	12,324,322	13,487,976	8,377,152	8,951,616	18,705,380	19,703,101	3,242,929	3,896,821	38,999,913	42,800,644
Railway operating expenses.	9,195,298	9,930,294	7,048,250[1]	7,327,003[1]	13,154,333	13,369,998	2,523,327	2,507,815	32,445,144	32,548,056[1]
Net revenue, railway oper.	3,129,024	3,557,542	....	....	5,551,047[4]	6,333,103[4]	719,602	1,389,016	6,545,769	....
Taxes	875,167	1,201,923	....	....	1,826,123	1,947,780	358,641	419,841	2,728,675	....
Operating income........	2,253,857	2,355,619	1,328,922	1,624,612	2,203,842[3]	2,856,477[3]	360,960	969,166	3,817,094	6,679,940
Non-operating income......	138,465	121,977	....	....	58,502	84,907	39,145	68,004	284,441	237,494
Gross income	2,392,322	2,477,596	1,328,922	1,624,612	2,262,344	2,941,404	400,105	1,037,170	4,101,535	6,917,434
Deduct. from gross income	1,232,568	1,221,717	943,255	926,389	1,851,109	1,903,776	544,018	798,694	6,944,798	6,710,863
Net income	1,159,754	1,255,879	385,677[4]	698,223[4]	411,235	1,037,628	*143,912*	238,476	*2,843,263*	206,571
Operating ratio..........	0.745	0.736	....	....	0.703	0.678	0.778	0.643	0.832	....

	United Traction Co., Albany, N. Y.		International Railway, Buffalo, N. Y.		Hudson & Manhattan R.R., New York, N. Y.		Long Island R.R., New York, N. Y.		New York Railways, New York, N. Y.	
	1930	1939	1930	1929	1930[2]	1929[2]	1930	1929	1930	1929
Railway operating revenue..	2,190,331	2,564,700	9,699,071	10,975,851	8,903,724	8,902,201	39,596,434	41,326,194	5,545,287	6,171,668
Railway operating expenses.	1,820,499[1]	2,172,318[1]	8,273,012[1]	9,036,143[1]	3,747,239	3,891,940	26,105,925	27,734,679	4,969,255[1]	5,440,358[1]
Net revenue, railway oper.	....	....	....	....	5,156,485	5,010,261	13,490,509	13,591,515	....	....
Taxes	....	....	....	....	980,632	978,938	3,453,370	2,922,226	....	....
Operating income........	369,832	392,382	1,426,058	1,939,707	4,175,853	4,031,323	10,025,730	10,649,328	576,032	731,310
Non-operating income......	18,894	18,650	87,250	92,621	2,116,795	2,012,274	....	....	130,873	....
Gross income..........	388,726	411,032	1,513,308	2,032,329	6,291,648	6,043,597	....	....	706,905	731,310
Deduct. from gross income	524,982	750,072	1,252,392	1,292,128	4,015,030	4,025,283	....	....	611,381[13]	730,260
Net income..........	*136,256*	*339,040*	260,916	740,200	2,276,617	2,018,314	....	....	95,523[12]	1,050[12]
Operating ratio..........	....	....	....	....	0.421	0.435	0.660	0.671	....	....

	N. Y., Westchester & Boston Ry., New York, N. Y.		Staten Island Rapid Transit Co., New York, N. Y.		Syracuse, Lake Shore & Northern R.R., Syracuse, N. Y.		Cincinnati Street Ry., Cincinnati, Ohio		Cleveland Railway, Cleveland, Ohio	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue..	2,485,395	2,530,488	2,448,959	2,637,897	314,449	400,866	8,123,961	8,819,944	17,648,758	18,403,945
Railway operating expenses.	1,521,839	1,570,218	1,829,710	1,892,347	308,792	348,165	5,552,059	6,021,349	13,902,681	15,685,628
Net revenue, railway oper.	963,555	960,270	619,249	745,550	5,657	52,701	2,571,901	2,798,594	3,746,077	2,718,317
Taxes	272,554	275,817	207,492	210,242	24,587	24,807	690,876	693,268	1,412,935	1,210,870
Operating income........	691,001	684,452	409,737	535,285	*18,930*	27,893	1,881,025	2,105,326	2,333,142	1,507,447
Non-operating income......	10,541	12,460	....	....	429	1,413	133,478	24,788	120,386	171,858
Gross income..........	701,453	696,912	....	....	*18,501*	29,306	2,014,502	2,130,114	2,453,528	1,679,305
Deduct. from gross income	2,794,876	2,667,847	....	....	....	....	2,250,164	2,126,609	258,621	260,933
Net income..........	*2,093,423*	*1,970,935*	....	....	....	....	*235,662*	3,505	2,194,907	1,418,372
Operating ratio..........	0.612	0.620	0.747	0.717	0.982	0.871	0.683	0.683	0.787	0.852

	City Railway, Dayton, Ohio		Lake Shore Electric Ry., Sandusky, Ohio		Oklahoma Railway, Oklahoma City, Okla.		Erie Railways, Erie, Pa.		Fairmount Park Transit Co., Philadelphia, Pa.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue..	831,905	950,997	1,397,938	1,871,693	2,695,143	2,289,887	1,086,935	1,202,157	284,539	338,032
Railway operating expenses.	690,478[1]	731,291[1]	1,729,734[1]	1,972,566[1]	2,247,159[1]	1,925,269[1]	872,255[1]	916,945[1]	143,617	156,913
Net revenue, railway oper.	....	....	....	....	....	....	....	....	140,922	181,119
Taxes	....	....	....	....	....	....	....	....	18,842	20,794
Operating income........	141,427	219,706	*331,796*	*100,873*	447,984	364,618	214,670	285,212	122,080	160,325
Non-operating income......	31,632	25,267	....	....	55,676	41,783	15,321	12,205	....	....
Gross income..........	173,058	244,973	*331,796*	*100,873*	503,660	406,401	229,991	297,417	122,080	160,325
Deduct. from gross income	19,822[10]	26,571[10]	400,417	354,651	378,307	274,835	160,338	163,513	106,500	107,217
Net income..........	153,236	218,402	*732,213*	*455,524*	125,353	131,566	69,653	133,904	15,580	53,108
Operating ratio..........	....	....	....	....	....	....	....	....	0.504	0.464

	Philadelphia Rapid Transit Co., Philadelphia, Pa.,		York Railways, York, Pa.		United Electric Railways, Providence, R. I.		Texas Electric Railway, Dallas, Tex.		Galveston-Houston Electric Railway, Houston, Tex.	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue..	52,034,691	55,909,553	2,953,470	2,795,190	6,544,504	7,279,860	1,601,042	1,864,816	501,041	584,490
Railway operating expenses.	36,049,866	38,666,747	1,687,013[1]	1,555,553[1]	5,442,670	5,927,498	1,203,786	1,277,584	299,719	329,020
Net revenue, railway oper.	15,984,825	17,242,806	....	....	1,101,834	1,352,362	397,256	587,232	201,322	255,470
Taxes	2,862,397	3,310,797	....	....	331,872	344,855	67,717	69,568	31,000	32,356
Operating income........	13,122,428	13,932,009	1,266,357	1,239,637	769,961	1,007,506	329,538	517,664	170,321	223,113
Non-operating income......	916,109	1,243,331	....	....	....	....	1,950	1,491	....	193
Gross income..........	14,038,537	15,175,340	1,266,357	1,239,637	769,961	1,007,506	431,488	519,155	170,321	223,306
Deduct. from gross income	11,240,327	10,837,831	316,768	293,122	608,389	610,269	510,045[14]	417,865	269,664	269,960
Net income..........	2,798,210	4,337,508	949,589	946,515	161,572	397,237	*78,557*	101,290	*99,343*	*46,654*
Operating ratio..........	0.693	0.691	....	....	0.831	0.814	0.752	0.685	0.598	0.564

Table III concluded on page 200

Table III—(Concluded)—Condensed Financial Reports of Electric Railway Properties, 1930-1929

All Figures Are in Dollars Unless Otherwise Indicated

	Houston Electric Co., Houston, Texas		**Charleston Interurban R.R., Charleston, W. Va.**		**Madison Railways, Madison, Wis.**		**London Street Railway, London, Ont.**		**Ottawa Electric Railway, Ottawa, Ont.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue...	3,092,815	3,375,857	740,322	839,938	382,388	436,165	610,435	592,843	1,764,166	1,887,124
Railway operating expenses...	1,947,464	2,085,804	457,397	516,077	281,059[1]	343,197[1]	513,413[1]	495,218[1]	1,243,521[1]	1,294,495[1]
Net revenue, railway oper..	1,145,351	1,290,053	282,925	323,861	....	....	....	....	....	....
Taxes....................	265,345	273,926	79,416	79,416	....	....	....	....	....	....
Operating income..........	880,004	1,016,125	203,509	244,445	101,329	96,968	97,022[4]	97,625[4]	520,645	592,629
Non-operating income........	7,653	11,733	....	....	....	....	....	....	....	....
Gross income.............	887,658	1,027,859	....	....	101,329	92,968	29,702[3]	34,529[3]	254,472[3]	366,781[3]
Deductions from gross income	363,200	398,669	106,381	111,398	48,700	61,365	45,185	31,199	163,351	182,590
Net income...............	524,458	629,190	97,128[4]	133,046[4]	52,629	31,603	*15,482*	3,445	91,121	154,191
Operating ratio.............	0.638	0.617	0.618	0.614	....	....	....	....	....	....

	San Diego Electric Ry., San Diego, Cal.		**Shreveport Railways, Shreveport, La.**		**Indiana County St. Rys., Indiana, Pa.**		**Salt Lake & Utah R.R., Salt Lake City, Utah**		**Montreal Tramways, Montreal, P. Q.**	
	1930	1929	1930	1929	1930	1929	1930	1929	1930	1929
Railway operating revenue...	1,565,724	1,624,534	567,586	667,217	77,054	88,610	727,734	810,838	15,352,510	15,669,911
Railway operating expenses...	1,334,669	1,356,560	487,935[1]	543,843[1]	55,868[1]	61,554[1]	695,309[1]	737,543[1]	11,427,715[1]	11,874,813[1]
Net revenue railway oper...	231,055	267,974	....	....	....	....	....	....	....	....
Taxes....................	114,221	163,686	....	....	....	....	....	....	....	....
Operating income..........	116,834	104,287	20,110[3]	70,178[3]	21,186	27,056	7,503[3]	48,373[3]	3,924,795	3,795,098
Non-operating income........	136,804	122,718	....	....	....	....	....	....	....	....
Gross income.............	253,638	227,005	20,110	70,178	21,186	27,056	7,503	48,373	3,924,795	3,795,098
Deductions from gross income	381,309	364,762	53,164	56,592	39,665	42,315	222,587	206,157	3,852,184	3,666,782
Net income...............	*127,671*	*137,757*	*33,053*	13,586	*18,479*	*15,259*	*215,084*	*157,784*	72,611	128,316
Operating ratio.............	....	....	....	....	....	....	....	....	....	....

	City & South London Ry., London, England.		**London Electric Railway, London, England.**		**London General Omnibus Co., London, England.**		**Metropolitan District Ry., London, England.**		**Havana Electric Ry., Havana, Cuba.**	
	1930	1929	1930	1929	1930	1930	1930	1929	1930	1929
Railway operating revenue...	£977,880	£923,505	£2,353,173	£2,360,213	£10,549,643	£9,695,925	£1,464,893	£1,605,539	5,192,054	5,694,051
Railway operating expenses...	578,868[1]	536,400[1]	1,263,603[1]	1,289,084[1]	9,757,605[1]	9,054,624[1]	941,800[3]	1,064,010[1]	4,404,630[1]	4,608,568[1]
Net revenue, railway oper...	....	....	....	....	....	....	....	....	....	....
Taxes....................	....	....	....	....	....	....	....	....	....	....
Operating income..........	399,012	387,104	1,089,570	1,091,129	759,193[3]	609,767[3]	523,093	541,529	787,424	1,085,483
Non-Operating income.......	76,850	75,372	154,872	186,749	377,826	416,386	334,837	307,924	17,608	31,457
Gross income.............	475,862	462,476	1,244,442	1,277,878	1,137,019	1,026,153	857,930	849,453	805,032	1,116,940
Deductions from gross income	357,432	344,448	638,937	674,902	854,849	745,474	416,032	485,932	631,670	643,360
Net income...............	118,430	118,028	605,505	602,976	282,170	280,679	441,898	363, 521	173,362	473,580
Operating ratio.............	....	....	....	....	....	....	....	....	....	....

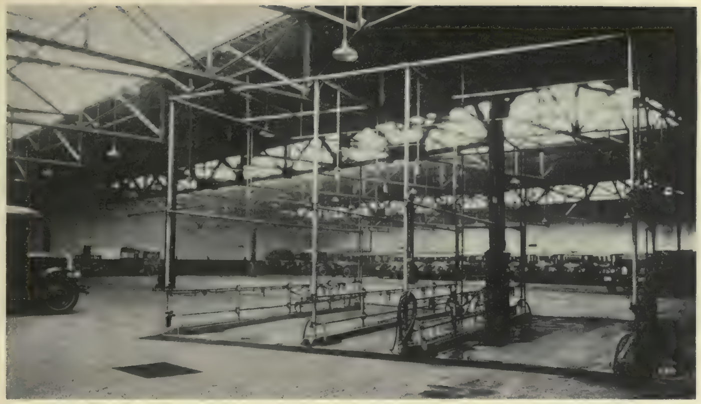
[1] Including taxes.
[2] Year ended June 30.
[3] After depreciation
[4] Before depreciation.
[5] Depreciation and accident reserve.
[6] Includes calculated taxes and fire insurance.
[7] After City of South Jacksonville portion of net.
[8] Net income before depreciation.
[9] Includes net revenue from auxiliary operations.
[10] Federal taxes.
[11] Two-thirds interest owned by Pacific Electric Railway.
[12] Before interest on income bonds not declared.
[13] Exclusive of interest on Broadway & Seventh Ave. R.R. bonds in default.
[14] Includes $195,065 interest for six months due Jan. 1, 1931 but not paid.
[15] Year ended Jan. 31.
[16] After deducting retirement expense.
[17] Preliminary 12-months statement.
[18] Includes affiliated companies.

the decrease in gross revenue. In fact, 57 of the reports for the past year showed a reduction in operating expenses from those of the previous year. In most instances the savings made in this manner, while substantial, were not sufficient to offset the loss of business. Accordingly the net revenue from railway operations shrunk in all but nine properties. As to net income, while it was greater than in the preceding year in 14 instances, this does not always mean an improvement, as a few companies paid only part or none of the accrued bond interest.

Turning now to the division according to the size of properties, there is a sharp contrast with the year 1929, in which most of the large companies made a gain in gross. Every one in this classification showed a loss last year. This was a reflection of the disturbed business situation, which affected to the greatest extent the larger manufacturing and commercial centers. The group of small companies made a somewhat better showing, two of them, the Tidewater Southern of Stockton, Cal., and the London Street Railway of London, Ont., Canada, having an increase in business. Four of the medium-sized properties also showed a gain. These were the Municipal Railway, San Francisco; the Hudson & Manhattan Railroad, New York, N. Y.; the Oklahoma Railway, Oklahoma City, Okla.; and the York Railways, York, Pa.

Economies in operation were almost universal. Reduction in operating expenses was made on all the large properties and on all but two of the smallest ones. In the classification of medium-sized properties, six had larger expenses. Of the nine companies that had an increase in operating revenue, five were in the middle group, one in the small-property group, and only one, the Cleveland Railway, in the group of large companies.

Perhaps a better indication of the effectiveness of the efforts to meet a trying situation is seen in the comparison of operating ratios given in Table II. Only three companies were unable to keep expenses below the level of receipts, and these three were relatively small. Three others, also of fairly small size, were in the range between 0.9 and 1.00. The remaining 40 companies for which operating ratios could be calculated were all below the limit of 0.90 ratio, and thirteen of them kept below 0.70. This compares favorably with the results of a year ago, when 41 out of 44 companies for which the operating ratios were calculated were in the range of less than 0.90.



Kinnickinnic garage where all bus engine and chassis overhaul is done. Spray cleaning racks are in foreground

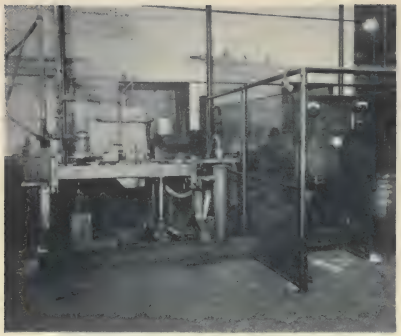
Comprehensive Bus Maintenance Program Promotes Efficiency in Operation *at Milwaukee*

Careful analysis of all performance records, regularly scheduled shop and road inspection, engineering follow-up and research, educational courses and co-operative bonus system are major factors in bus maintenance program of the M.E.R. & L. Company

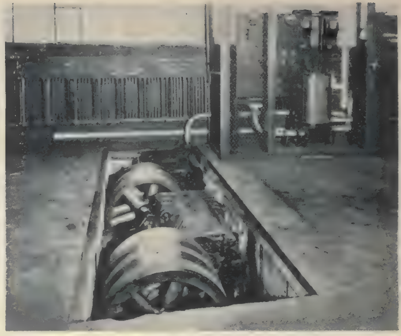
ACCURATE records of operation and performance, a thorough system of shop and road inspection and budgeted control of current work comprise the foundation upon which the bus maintenance program of the Milwaukee Electric Railway & Light Company functions. The theories and philosophies of good maintenance have been put into practical use in Milwaukee to produce, not only a mechanical efficiency in operation, but a personnel that is equipment-conscious. These factors, plus a constructive research program have made it possible for the company to achieve lower maintenance costs, fewer road delays and greater mileage records.

All buses operated by the Milwaukee Electric Railway & Light Company are equipped with speedometers and a special effort is made to keep them in operating condition. Scheduled inspections and routine maintenance are based on mileage operated as recorded by the speedometers. At the end of his run, each operator turns in to the garage a bus condition report which bears the number of the bus, the mileage reading, the date and a statement as to the condition of that bus during the time he had it. The operator must make a definite statement when turning the bus in, either by checking a form which lists minor troubles, or by stating that the bus is in good condition. These forms are turned over to the foreman of the garage each night, who either O.K.'s the bus for future service or places it on the list for further inspection or repairs. The mileages taken from these operators' sheets are entered on the individual bus record and control the routing of the bus for the regularly scheduled inspection, repairs or overhaul.

In addition to this daily or running inspection and



Run-in stand where bus engines are overhauled



Dynamometer for testing installed bus engines

maintenance, there are three definite periods at which a vehicle receives special attention. These are, after 1,000 miles, 10,000 miles and 50,000 miles. When a bus is held out of service for one of these inspections, it is subjected to a definitely planned routine, outlined by a form to cover the tests to be made and work to be done. Each item of work on this form is listed and numbered and a space is provided opposite the number for the signature of the inspector or of the mechanic who performs the duty. This procedure is carried out at all major inspections and repairs and before a bus is O.K.'d for further use it is tested on the road by the foreman who must add his signature to the form.

At the 1,000-mile inspection, the following routine is

Wear Limits and New Work Clearances Observed During Engine Overhaul

Pistons

Wear Limits	*New Work Clearances*
Reject when worn more than 0.0015 per inch of diameter. 0.010 in width of upper ring groove.	Cast iron 0.001 per inch of diameter. Split skirt alloy (aluminum) same as cast iron. Solid skirt alloy (aluminum) 0.002 per inch diameter. When more than 0.015 oversize add 0.001 to total clearance.

Piston Pins

Wear Limits	*New Work Clearances*
Replace pins of bushings when worn to: 0.002 in bronze bushings 0.002 in cast iron pistons without bushings 0.001 in aluminum alloy-test when cold.	Hand push fit in bronze bushings. Light tap fit in aluminum alloy pistons. Finger push fit when in cast iron direct. Light drive fit when locked in piston.

Valve Stem to Guide

Wear Limits	*New Work Clearances*
Replace guides when worn to: 0.008 intake. 0.010 exhaust.	0.002 to 0.003 intake. 0.003 to 0.004 exhaust.

Timing Gears

Wear Limits	*New Work Clearances*
Replace when worn more than: 0.004 to 0.005 on metal gears. 0.008 to 0.010 on composition gears.	Just free to slide, which will be 0.001. New gears are too tight if they will cut tissue paper when gears are revolved.

Timing Chains

Wear Limits	*New Work Clearances*
Model Y and Y-Z Yellow Coach should be replaced at overhaul when within 1¼ in. to limit of adjustment. Fageol 4 and 6 when ⅛ in. longer than new chain.	Model Y and Y-Z adjust to 1/32 play in sprocket. Fageol 4 and 6 adjust to 1/32 play in sprocket. Model E-EZ and Z have no adjustments.

Crankshafts

Wear Limits	*New Work Clearances*
Regrind when worn more than: 0.003 taper. 0.003 out of round. or very rough at pins or journals. or at 0.002 when necessary to replace bearings.	Allowance for oil clearance on new work: 0.002 for babbitt. 0.003 for Summit metal. Allowance of side and end play: 0.005 end play when single bearing takes thrust. 0.008 to 0.010 end play when taken by two or more. 0.006 to 0.010 for connecting rod side play.

Cylinder Walls

Wear Limits	*New Work Clearances*
Regrind when worn more than: 0.010 at a point ¾ in. from top of wall or travel. 0.005 out of round.	Cylinder walls ground to regular oversizes as 0.010—0.020—0.030—clearance allowed on piston.

Piston Rings

Wear Limits	*New Work Clearances*
Replace rings at a clearance of 0.020 to 0.030 in motors of high oil consumption.	3½ in. to 4½ in. bore allow 0.010 to 0.012 gap on step cut rings or any lap joint rings. 3½ in. to 4½ in. bore allow 0.007 to 0.009 gap on "mitre" or slant cut rings.

Junk Ring Clearances

Wear Limits	*New Work Clearances*
Replace when scored or warped or when more than 0.008 loose in ring groove.	Gap 0.008 Groove 0.003 min., 0.008 max.

Oil Pumps—Gear Type

Wear Limits	*New Work Clearances*
Blacklash between teeth—0.005 Clearance between gear teeth and outside of pump body—0.006 Pump gear end play—0.007 Pump gear shaft bushings 0.005	Backlash between teeth—0.0015 to 0.0025 Clearance between gear teeth and outside of pump body—0.001 Pump gear end play—0.001 Pump gear shaft bushings—0.001

Ignition Breaker and Point Spring Tension

Wear Limits	*New Work Clearances*
Replace spring which has less than 12 oz. pull at point of contact.	Ideal tension is 16-20 oz. pull at point of contact.

Spark Plug Cap and Compression Test

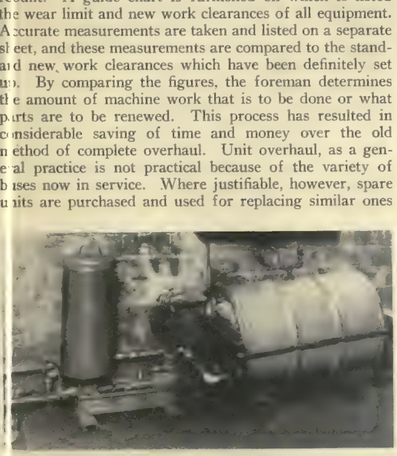
Wear Limits	*New Work Clearances*
Gap when using scintilla magneto—0.015 All other types of ignition—0.025	Plugs should be tested under 125 lb. using 0.025 gap on the Thor-O-Test.

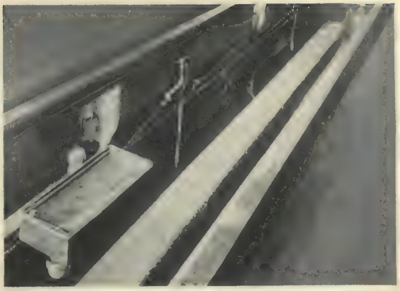
Tappet Clearances

White—Model 15	0.010 exhaust	0.008 intake
White—Model 15-45 and 50	0.012	0.010
Pierce-Arrow	0.008	0.006
International—Waukesha	0.012	0.010
International—Lycoming	0.008	0.006
Hudson	0.008	0.006
Yellow Coach Model—W	0.010	0.008
Twin Coach	0.016	0.010

carried out. Brakes are tested for holding and equalization. Engines are tested for knocks, spark plugs are cleaned, breaker points are checked and the entire ignition system thoroughly inspected. Fan belts and pulleys are inspected and checked for alignment. Gasoline filters are examined for water, and if water is present, gasoline is drained from the carburetor and main tank. Generator and air compressor drive coupling fabrics are examined, batteries are checked for water and hold down clamps, tires are checked for condition, pressure and wheel nuts. Treadle plates are cleaned underneath, moisture is drained from air tanks, propeller shaft universal joints are tested for play, and all springs are examined for broken leaves. Under the heading of "lubrication," the following checks are made and work is done: Crankcases are drained; transmission and rear axle oil levels are checked; universal joints and all Alemite fittings are filled with grease; and springs, brake and clutch mechanism clevises are sprayed with oil. Crankcases are then refilled. The air compressor is filled with medium engine oil and the air intake strainer is cleaned thoroughly, and light engine oil is added to the level hole in the cleaners. All throttle mechanism is oiled. Generators, distributors, starting crank and shifting tube and fan bearings are lubricated and water pump glands are filled with a special grease.

At the 10,000-mile inspection and the 50,000-mile overhaul other similar forms are used for the work to be done. These likewise are signed by the mechanics doing the work and finally O.K.'d by the foreman and inspector after a road test. The forms covering these maintenance procedures are divided into the following headings, with specific tests and work carefully outlined: motor, electrical system, clutch and gear sets, speedometer, front axle and steering, rear axle and brakes, tire and tools, body and cleaning. Complete overhaul is not based on the assumption that because a bus has gone the scheduled number of miles it must be completely torn down and rebuilt. A guide chart is furnished on which is listed the wear limit and new work clearances of all equipment. Accurate measurements are taken and listed on a separate sheet, and these measurements are compared to the standard new work clearances which have been definitely set up. By comparing the figures, the foreman determines the amount of machine work that is to be done or what parts are to be renewed. This process has resulted in considerable saving of time and money over the old method of complete overhaul. Unit overhaul, as a general practice is not practical because of the variety of buses now in service. Where justifiable, however, spare units are purchased and used for replacing similar ones undergoing repair. The guide charts of wear limits and new work clearances are strictly adhered to.


Alemite tank and Lubrigun, connected in series and under pressure for supplying grease to inspection pits


Inspection and repair pit showing lines and connections which deliver grease and oil under pressure

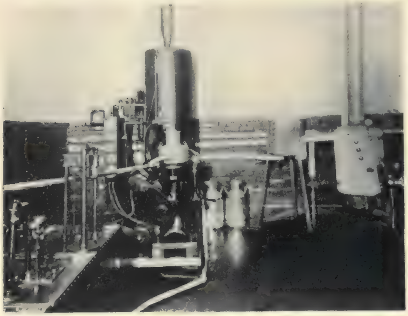
By far the most valuable factor in the general maintenance program of the Milwaukee Electric Railway & Light Company is the system of records kept in the various departments. These records have been compiled over a period of years and include such data as performance of vehicles by groups, classified by make, road service calls and road delays, gasoline consumption, tire performance, battery service, new equipment tests, spring replacements and repair costs, and comparative tests made on parts by the equipment engineer. These records are kept up to date, some of them being studied daily and all of them summarized periodically. They have been not only a guide to the establishment of maintenance practices and methods, but also a basis for equipment renewals and consequent continuous modernization of the fleet.

The details of several of these records and the results in equipment and practice that they have directly affected are significant. For more than six years every road call, whether it caused a delay or not, has been carefully recorded and studied. These road calls are reported daily and a copy of the report is sent to the equipment engineer, to the superintendent in charge of bus maintenance, and to the superintendent of equipment. These reports are also summarized monthly, and a number of graphs are kept to show the trend in road failures. As a result of these records, definite practices have been included in the running maintenance program for the inspection and checking of equipment and the result has been a decrease in the average number of delays per month with a constantly increasing mileage. In 1924 the buses operated by this company ran approximately 255,000 miles per month, and the average number of delays per month was 66. In 1930 the average monthly mileages increased to more than 500,000 and the road delays decreased to 44.7.

Gasoline, oil and tire records are kept on printed forms by the equipment engineer. These forms show the consumption and performance record for each bus over a three-month period. Monthly totals of mileages and gallons of gasoline and oil are kept by groups, averages are taken and any vehicle showing an efficiency 10 per cent under this average is put on a special inspection list, and the faulty equipment given a thorough check and repair. Battery performance likewise has been recorded over a period of years and, as a result, the company has adopted a policy of using two 6-volt batteries in series instead of one 12-volt battery wherever space in the bus permits. Data gathered on this subject have proved to the company that this practice gives more battery capacity, will stand a higher charging rate, has more reserve, reduces battery changes and lengthens battery life.

The cost of replacing or repairing springs has been carefully watched over a period of years, and the company has adopted the practice of completely replacing such springs to which the cost of repairs would exceed $15. An arrangement with a local concern for making spring repairs has proved very satisfactory, and has enabled the company to reduce its new and repair spring costs to 0.065 cent per mile.

In addition to the records of past performances kept by the company, there is a definite policy of constructive research carried on by a special engineer. His duties include the keeping of daily records, analyzing road calls and making monthly summaries of them, riding the various lines and reporting on the condition of equipment on the road, testing new equipment, such as oil, brakes, lining, spark plugs, etc., and developing maintenance methods and practices for the saving of equipment, time and labor. His duties keep him abreast of all maintenance problems and all new equipment submitted for the consideration of the company.



All crankcase oil is drained to tanks installed beneath inspection pits from which it is pumped to this oil reclaimer

A close control of maintenance costs is made possible by the system of budgeting labor-hours to all maintenance departments and equipment accounts. These budgets are set up on a monthly basis, considering 31 days to the month, and each foreman knows at all times the number of labor-hours he can use on any particular day. Daily accumulative records are kept both by the foreman and the superintendent of equipment and, unless special permission is given, the foreman must regulate his work in such a manner that he does not exceed the maximum number of hours assigned to him for any month. If an excessive number of hours are used on one day they are usually compensated for during the succeeding days of the month.

Another major factor in the successful operation of the maintenance program in Milwaukee is the policy of education and the continuous development of the personnel into more efficient workmen. The apprentice system is carried out through all shop departments, and under this system apprentices are indentured under state law and are under contract for a period of four years. Young boys are usually hired for these positions and the company is obligated to give them a definite course of training during their apprenticeship. At the end of their course they are given certificates of graduation and $100 in gold, as a bonus. At the present time there are 30 men in training in the maintenance department as a whole, seven of whom are in the bus garages. This system has been a definite asset not only to the company but to the employees themselves.

A mutual gain-sharing plan is operative throughout the rolling stock department of the company. The plan was developed in accordance with the company's general policy to produce a highly efficient organization, and has distributed the gains made by such efficiency among its employees. The plan gives the employees in the rolling stock department a direct personal responsibility and interest in the efficient operation of the company. It permits the earning of additional compensation over and above the present graduated scale of wages and the improvement of personal and departmental efficiency. The plan furnishes an incentive for greater co-operation between employees, and tends to retain employees in the service of the company. It lessens the need for supervision as the personal efficiency increases and permits a smaller amount of capital to be invested in machine tool equipment as the output per unit is greater. The plan also lessens the amount of scrapped material or loss on account of poor quality of work, as the employee is paid for work which passes inspection only.

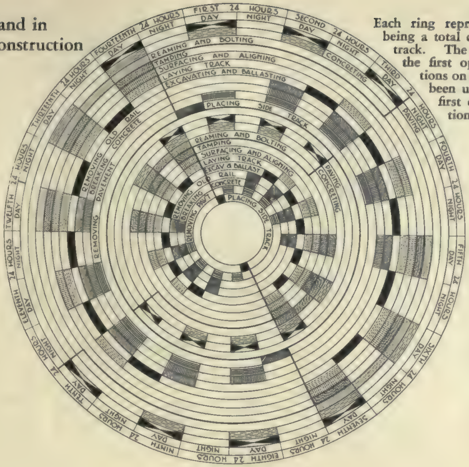
FOUR COMPONENTS TO BONUS PLAN

The employees in the bus department who participate in this bonus or gain-sharing plan, comprise all day and night, full-time regular employees at the garages of the rolling stock department. They receive a gain or bonus from savings effected through the reduction of operating and maintenance costs of company-owned and operated gasoline vehicles, automobiles, trucks and buses. The plan for bus operation consists of four components, a tire, a gasoline, a repair and a labor component. The tire component has been designed to measure the quality of maintenance and repair work on tires and to pay a bonus for each mile run in excess of a fixed mileage.

The gasoline component was designed to furnish an incentive to reduce the gasoline consumption by keeping the buses in proper repair and adjustment. The repair component is designed to encourage economy in the use of material and to pay a bonus in proportion to the economies effected. The labor component furnishes an incentive to decrease the amount of labor required to maintain the cars, and pays a bonus for reduction in the number of labor hours required per bus mile operated.

The gain in dollars under each of the above components, except the tire component, is calculated separately for each type of bus for which units are provided, and when the same type of bus is used by both the Wisconsin Motor Bus Lines, a subsidiary company, and the transportation department, it is calculated separately for each group. The payments made to the employees are co-ordinated with a building and loan system operated by the company. A minimum of 50 per cent of the bonus must be placed in this saving plan and the balance may be drawn in cash.

Chart Used in Cleveland in Scheduling Track Reconstruction



Each ring represents one operation, there being a total of eleven for each section of track. The innermost ring represents the first operation. When the operations on the first section of track have been under way for seven days the first operation on the second section is scheduled to start.

Scheduling of Track Reconstruction

Reduces Labor Cost

Careful planning insures maximum efficiency in the use of both men and machinery. Construction cycle of one week has been adopted at Cleveland during which each gang completes the replacement of 2,000 ft. of single track

By

HOWARD H. GEORGE

Superintendent of Way
Cleveland Railway

SCHEDULING of operations on all major track construction jobs is essential to secure co-ordination of the various tasks involved and to insure the work being completed within the allowed time limit. It also is valuable in enabling the contractor to control his construction costs and to tell promptly when his estimated costs are likely to be exceeded. Without such a schedule, it would be impossible to run any modern project with reasonable hope of its ending a financial success.

After several years experience with such a system in connection with large building and general contracting operations, and recognizing its value in controlling the use of both labor and equipment, as well as controlling the delivery of construction materials and of fixing within reasonable limits the completion dates, the writer decided to apply it to his track reconstruction program in Cleveland last year. The results obtained have proved highly beneficial, and it is felt a description of the methods employed may be of considerable value to other track engineers in solving similar problems.

In preparation for placing the plan into effect, a careful study was made of the performance of the various pieces of track construction equipment when working to capacity. Records also were made of the individual general foremen and the labor-hours required for the various operations. It soon was found that performance, both in the case of labor and equipment,

Table I—Summary Track Reconstruction Schedule, 1930

Foreman	Street	From	To	Stretch No.	Feet Single Track	Date Started	Date Completed
Murphy	St. Clair	180′ E-E. 55th	1990′ E-E. 55th	1-EB	1810	5-14	5-31
"	"	180′ W-E. 79th	1990′ W-E. 79th	2-EB	1810	5-22	6-9
"	"	180′ E-E. 55th	1999′ E-E. 55th	3-WB	1819	6-1	6-17
"	"	180′ W-E. 79th	2000′ W-E. 79th	4-WB	1820	6-9	6-25
"	"	180′ E-E. 9th	2052′ E-E. 9th	5-EB	1872	6-17	7-5
"	"	1999′ E-E. 55th	2000′ W-E. 79th	6-WB	1820	6-25	7-14
"	"	180′ E-E. 9th	2043′ E-E. 9th	7-WB	1863	7-5	7-22
"	"	1990′ E-E. 55th	1990′ W-E. 79th	8-EB	1810	7-14	7-30
"	"	2043′ E-E. 9th	E. 23rd St.	9-WB	1862	7-22	8-6
"	"	E. 82nd St.	2297′ E-E. 82nd	10-EB	2117	7-30	8-13
"	"	2052′ E-E. 9th	E. 23rd St.	11-EB	1873	8-6	8-21
"	"	E. 82nd	2240′ E-E. 82nd	12-WB	2060	8-13	8-27
Croyle	Broadway	E. 15th St.	Pittsburgh Av.	1-EB	1023	5-19	6-5
"	"	180′ E-E. 55th	180′ W-Union Av.	2-EB	1398	5-27	6-13
"	"	E. 15th St.	Pittsburgh Av.	3-WB	999	6-5	6-22
"	"	180′ E-E. 55th	180′ W-Union	4-WB	1389	6-13	7-7
"	W. 25th St.	180′ N-Denison	1666′ N-Denison	9-NB	1486	6-22	7-9
"	"	Sackett Ave.	2000′ S-Sackett	10-NB	1973	6-30	7-17
"	"	180′ N-Denison	1626′ N-Denison	11-SB	1446	7-9	7-25
"	"	Sackett Av.	2000′ S-Sackett	12-SB	1890	7-17	8-2
"	Pittsburgh	Broadway	180′ W-E. 34th	7-EB	1786	7-25	8-9
"	W. 25th St.	2000′ S-Sackett	1666′ N-Denison	16-NB	1000	8-2	8-17
"	Pittsburgh	Broadway	180′ W-E. 34th	5-WB	1810	8-9	8-24
"	W. 25th St.	2000′ S-Sackett	1626′ N-Denison	14-NB	1000	8-17	8-30
C. Ross	E. 55th St.	S. End of Viaduct		Both	469	6-18	6-23
"	Ontario St.	Huron Rd.	Prospect Av.	NB	509	7-4	7-8
"	E. 105th	Arthur	Quincy	"	2345	7-22	8-9
"	St. Clair Av.	Ends at E. 55th St.		"	360	8-6	8-10
"	W. 25th St.	Ends at Denison Ave.		"	360	8-11	8-14
"	St. Clair Av.	Ends at E. 9th St.		"	360	8-14	8-18
"	"	Ends at E. 79th St.		"	360	8-18	8-22
"	Pittsburgh Av.	Ends at E. 34th St.			360	8-24	8-29
E. Coe	Euclid Ave.	E. 118th St.	E. 123rd St.	EB	815	6-22	7-3
"	"	"	"	WB	701	7-6	7-15
"	"	Malone Crossing	Chardon Rd.	EB	5200	7-9	7-31
"	"	" "	"	WB	4833	7-9	7-31
Anthony	Broadway	Ends at E. 55th St.		Both	365	7-8	7-12
"	Denison	W. 39th St.	W. 73rd St.	EB	7697	7-22	
"	"	"	"	WB	7380		

varied considerably under different foremen and, in the case of the equipment, under different operators.

The data thus collected were carefully studied and a tentative standard set up in each case. One of the objects of the track foremen's training school, conducted during the first three months of the year, as described in Electric Railway Journal for August, 1930, was to give the foremen a more thorough training in track construction methods and to impress upon them the need for uniformity in the practices followed. This was the groundwork upon which we depended for securing a reasonable degree of success when the plan finally was placed in effect.

In our track construction operations the first step is the installation of the temporary side track and portable crossovers which carry the service while the main track is under construction. This, then, constitutes the first operation. Such work is almost invariably done at night when the service is least frequent, and interference to regular operation consequently is at a minimum. We consider it essential that the installation be completed between the hours of midnight and 5 a.m., so that the temporary track is ready for operation when the first regular day runs pull out of the carhouse. Our track sections under construction at one time are usually not more than 2,000 ft. in length and, consequently, the number of men required is such as will be able to install this amount of side track during the available time.

The next operation is the plowing of the pavement between rails, with such preliminary work as removal of track drips, sewer manhole frames, water valve hous-

Table II—Schedule of Track Equipment Requirements

Operations	Equipment No.	Equipment Kind	Operators	Foremen	Laborers
Moving tools	1	Truck	1	1	6
Installing crossovers (two single)	1	Derrick	2	1	10
Installing crossovers (two double)	2	Derrick	4	2	18
Unloading side track boards					3
Placing side track boards					6
Splicing					3
Handling red lights and flagging					3
Installing crossovers and turnouts					10
Installing 60 sections of side track and crossovers (complete)	2	Derrick	4	2	25
Removing outside and devilstrip pavement, drips, etc.					
Compressor—two hammers	1	Compressor	1		4
Hand —two bars					3
Plowing	1	Plow	2	1	5
Clearing and loading old pavement	1	Work train	2	1	10
Removing old pavement cushion					8
Breaking concrete (Clark breaker)	1	Clark breaker	1		1
Breaking concrete (Compressor) two hammers	1	Compressor	1		4
Preparing rail for burning					4
Burning rail and fastenings	1	Burn. Car	2		
Removing old rail from trench					4
Loading old rail	1	Derrick	2	1	4
Excavating (electric shovel)	1	Shovel	1		3
Handling old ties and making temporary crossings					6
Power grader (subgrade and drain tile trench)	1	Grader	1		2
Roller (subgrade)	1	Roller			
Unloading drain tile					4
Placing drain tile					4
Unloading coarse slag for ballast	1	Work train	2		1
Spreading coarse slag (power grader)	1	Grader	1		2
Rolling slag ballast	1	Roller			
Unloading ties—per tie Placing and spacing ties—per tie Unloading tie plates, base plates, spikes, etc. Unloading rail	1	Derrick	2		5
Cutting rail					2
Placing rail and splicing					3
Placing tie plates and screw spikes					4
Spiking, screw spikes					5
Spiking cut spikes					3
Placing: Tie rods					1
Placing: Joint base plates					3
Unloading: fine slag for tamping	1	Work train	2		1
Spreading fine slag for tamping					4
Surfacing and aligning				1	6
Tamping: Machine (4 tools)	1	Compressor	1	1	6
Tamping: Hand, per tie					4
Final setting—screw spikes					2
Thermit Welding	1	Welding car			7
Reaming and bolting					4
Seam Welding (two machines)	1	Welding car			3
Preparing trench for concreting					6
Final check tamping (hand)					2
Unloading gravel	1	Work train	2		1
Unloading cement	1	Work train	2		12
Cutting rail and placing splices for drips					2
Burning rail for drips	1	Burning car	2		
Handling cement					2
Loading conveyor					5
Skip loaders					1
Spreading concrete					5
Tamping concrete					1
Concreting	1	Mixer & Conveyor	1	1	14
PAVING GANG—EQUIPMENT REQUIREMENTS					
Unloading: paving cushion	1	Work car	2		1
Spreading: paving cushion					4
Mixing and placing plaster					3
Placing paving (pavers)					6
Placing paving (laborers)					3
Pounders					2
Grouting Pavement		Handling cement			1
		Handling sand 1 grouter			2
		Operators			2
		Broomers		1	2
Sprinkling Pavement, to be done by watchman					
Grinding Joints	1	Grinder	2		
Cleaning street	1	Work car	2	1	12
Removing crossovers (two single)	1	Derrick	2	1	10
Removing crossovers (two double)	2	Derricks	4	2	18
Removing 60 sections, side track and crossovers (complete)	2	Derricks	4	2	25

ings, monument boxes, etc., which would be damaged by and interfere with the operation of the plow. The speed of this operation is usually such that the entire stretch can be plowed between rails within a period of not more than two hours, usually less than this. Removal of pavement in the devil-strip and outside the outer rail is done by pneumatic tools and hand labor.

Another Phase of Work Starts Immediately After Completion of the First

Following the plowing comes the removal and loading of the pavement into work cars, for such disposal as the character of material may require. This is followed by the removal of all pavement cushion. The next step is the breaking of the concrete pavement base by the use of the Clark concrete breaker. This operation is scheduled to start as soon as a sufficient amount of pavement cushion has been cleared away to give the machine a place to work. Immediately behind the concrete breaker we start an acetylene-burning outfit, cutting the old rails to lengths suitable for handling, and burning of any old tie rods and clips which may still be holding the rail to the ties.

Table III—Schedule of Operations

St. Clair Avenue from East 9th Street to East 23rd Street and East 55th Street to East 102nd Street—28,154.0 ft. Single Track

Date	No	Operation	Hours	Laborers	Foremen	Feet of Single Track
May 14 N	1	Temporary track		25	2	1980
May 15 D	2	Removing pavement		14	2	282
May 15 N						
May 16 D	2	Removing pavement	8	18		
		(Balance of day to Oper. No. 4)	4	4		423
	3	Breaking concrete		7		470
	4	Removing old rail	8	5		
		(Balance of day to Oper. No. 2)	4	4		470
				34		
May 16 N	5	Excavating and ballasting		5		450
May 17 D	2	Removing pavement	8	24		
		(Balance of day to Oper. Nos. 4 and 7)	4	4		565
	3	Breaking concrete		7		470
	4	Removing old rail	8	5		
		(Balance of day to Oper. No. 2)	4	4		470
	6	Laying track		14		376
				54		
May 17 N	5	Excavating and ballasting		5		450
May 19 D	2	Removing pavement	8	19		
		(Balance of day to Oper. Nos. 4 and 7)	4	9		540 (comp)
	3	Breaking concrete		7		470
	4	Removing old rail	8	5		
		(Balance of day to Oper. No. 2)	4	4		470
	6	Laying track		14		423
	7	Surfacing and aligning				
		(Balance of day to Oper. No. 2)	4	5		188
				54		
May 19 N	5	Excavating and ballasting		5		450
May 20 D	3	Breaking concrete		7		400 (comp.)
	4	Removing old rail		9		400 (comp.)
	6	Laying track		14		423
	7	Surfacing and aligning		6		753
	8	Tamping		12		602
	9	Reaming and bolting		6		565
				54		
May 20 N	5	Excavating and ballasting		5		460 (comp.)
May 21 D	6	Laying track		14		423
	7	Surfacing and aligning		6		660
	8	Tamping		12		602
	9	Reaming and bolting		4		565
	10	Concreting		18		452
				54		
May 21 N	9	Reaming and drilling		5		471
May 22 D	6	Laying track				
		(Balance of day to Oper. No. 10)	2	14		165 (comp.)
	7	Surfacing and aligning				
		(Balance of day to Oper. No. 10)	2	6		209 (comp.)
	8	Tamping		12		606 (comp.)
	9	Reaming and bolting		2		209 (comp.)
	10	Concreting (Bal. of day to Oper. 6 and 7)	6	20		452
	11	Paving				452
May 22 N	1	Temporary track-stretches No. 2		25		
May 23 D	10	Concreting-Stretch No. 1		20		452
	11	Paving Stretch No. 1				452
	2	Removing pavement—Stretch No. 2		14		282
				34		
May 23 N						
May 24 D	10	Concreting—Stretch No. 1		20		452 (comp)
	11	Paving Stretch No. 1				452
	2	Removing pavement—Stretch No. 2	8	18		
		(Balance of day to Oper. No. 4)	4	4		423
	3	Breaking concrete—Stretch No. 2		7		470
	4	Removing old rail—Stretch No. 2	8	5		
		(Balance of day to Oper. No. 2)	4	4		470
				54		
May 24 N	5	Excavating and ballasting—Stretch No. 2		5		450

Legend:

D = Day

N = Night

The removal of the rails from the track trench ordinarily is done by hand labor during the day, when the derrick would interfere with regular operation. They are lifted out and placed alongside the track trench, to be later picked up by the derrick, loaded on rail cars and removed to the yard.

As soon as the removal of the rail has reached the point where enough trench has been prepared to give the electric shovel a stretch for one night's work, this equipment is brought in, the excavation all being done at night. Excavated material is all loaded on side-dumping work cars and usually disposed of at our own dump.

One operator follows immediately behind the shovel with a grading machine and a gasoline-driven roller. The grader is used to level the subgrade and to spread the slag ballast. The roller compacts the subgrade and also the crushed slag ballast. This ballast is also delivered at night. Within a few minutes of the time the shovel finishes the night's work, the subgrade behind it has been leveled and rolled and the ballast spread and compacted ready for track laying that day. During this operation, regular car service is single-tracked over the temporary side track, the second main track being used for our work trains.

The track-laying gang is so organized as to be able to lay enough track in the day to just reach the shovel by quitting time. The next day tamping and lining of the section of track which was laid the previous day is completed, this being followed immediately by the reaming and bolting of all joints just in advance of the electric welding crew. This is followed by a concreting gang on the following day, and during that afternoon we put a small gang to work applying rail plaster to the rail webs, so that this has a chance to partially set before the paving gang starts to work the next morning.

Crews Work Simultaneously at Different Parts of Job

From this it will be seen that during a certain part of the general operation we have our shovel, grader and roller, track-laying, track-surfacing, welding, concreting and rail-plastering crews all working immediately behind each other at the same time, so that the work proceeds at maximum speed. The size of the paving crew is such that it can complete one section in time to be shifted directly to the next section without waiting.

The final operation in the schedule is, of course, the removal of the temporary side track and crossovers and cleaning up the street, but this is not done until at least four days after the grouting of the pavement has been completed. This allows one week minimum between the placing of the concrete foundation and the time the track is opened to car and vehicular traffic. We have found this to be ample. Where, for any reason, we find it necessary to turn traffic onto new track within a shorter time, we use an accelerator in both our concrete and pavement grout. In such instances we have allowed traffic over new track within 24 hours, apparently without any detrimental result. This could also have been accomplished by the use of a high early-strength cement.

Use of a vibration machine on the track structure, a recent development of the International Steel Tie Company, has also proved of decided value in permitting cars to be operated over freshly concreted track without damaging the bond of the concrete to the track structure. This has also been successfully applied to wood tie track in Cleveland. As a matter of fact, its advantages are sufficient, in our opinion, to warrant the use of this machine on all our track reconstruction work. The high-frequency vibration set up in the entire track structure causes the mortar to flow into every crack or opening, and seems to bond every wood fiber into the concrete, completely sealing the rail against the entrance of water to the base and fastenings. Inspection and comparison of exposed concrete surfaces when side forms are removed indicates clearly the superiority of the concrete where vibration has been employed over that where the concrete was merely tamped. It is essential, however, that side forms be installed along the devilstrip side when vibrating the first track.

The first step in the actual compilation of a schedule was the determination of the construction cycle, and we finally agreed upon a period of one week for this purpose. This meant that our schedule calls for the opening of a new section of approximately 2,000 ft. in length each week by each construction gang. The organization of each subdivision of the gang is based upon this same cycle period. The accompanying chart was developed and used throughout the season as the basis for the compilation of the detailed schedules for every track section.

Table IV—Schedule of Paving Block Requirements

Part of Track	Sq.Yd. per foot	Requirements for number of feet of track listed. 1 Pocket 35 Sq.Yd.	1 Car 105 Sq Yd.	1 Train 315 Sq.Yd.
Track (122 lb. rail)	0.473	74	222	666
Devilstrip (any rail)	0.547	64	192	576
1 foot of outside (any rail)	0.111	315	945	2,835
1½ ft. of outside (any rail)	0.148	236	708	2,124
2-ft. of outside (any rail)	0.223	157	471	1,413
2½ ft. of outside (any rail)	0.267	131	393	1,179
3-ft. of outside (any rail)	0.333	105	345	1,035
Track and one foot of outside (122-lb. rail)	0.583	[illegible]	180	540
Track and 1½ ft. of outside (122-lb. rail)	0.626	55	165	495
Track and 2-ft. of outside (122-lb. rail)	0.700	50	150	450
Track and 2½ ft. of outside (122-lb. rail)	0.745	47	141	423
Track and 3-ft. of outside (122-lb. rail)	0.814	43	129	387
Track and devilstrip (122-lb. rail)	1.029	34	102	306
Track, devilstrip and outside (1-ft.)(122-lb. rail)	1.129	31	93	279
Track, devilstrip and outside (1½ft.) (122-lb. rail)	1.167	30	90	270
Track, devilstrip and outside (2-ft.) (122-lb. rail)	1.250	28	84	252
Track, devilstrip and outside (2½ ft.) (122-lb. rail)	1.296	27	81	243
Track, devilstrip and outside (3-ft.) (122-lb. rail)	1.346	26	78	234
Track, (Tee rail)	0.547	64	192	576
Track, 1-ft. of outside, T-rail	0.661	53	159	477
Track, 1½-ft. of outside, T-rail	0.714	49	147	441
Track, 2-ft. of outside, T-rail	0.761	46	138	414
Track, 2½ ft. of outside, T-rail	0.833	42	126	378
Track, 3-ft. of outside, T-rail	0.897	39	117	351
Track and devilstrip, T-rail	1.094	32	96	288
Track and devilstrip and 1-ft. outside (T-rail)	1.207	29	87	261
Track and devilstrip and 1½ ft. outside, (T-rail)	1.250	28	84	252
Track and devilstrip and 2-ft. outside (T-rail)	1.296	27	81	243
Track and devilstrip and 2½ ft. outside, (T-rail)	1.346	26	78	234
Track and devilstrip and 3-ft. outside, (T-rail)	1.400	25	75	225

Part of Roadbed	Tons per foot	Requirements for number of feet of track listed One Pocket 7½ tons	One Car 22½ tons	One Train 67½ tons
Fine Slag Paving Cushion:				
Track only	0.022	346	1,038	3,114
Devilstrip	0.025	300	900	2,700
Track and devilstrip	0.047	160	480	1,440
1-foot outside	0.005	1,477	4,431	13,293
1½-ft. outside	0.008	985	2,955	8,865
2-ft. outside	0.010	739	2,217	6,651
2½-ft. outside	0.013	585	1,755	5,265
3-ft. outside	0.015	489	1,467	4,401
Track and 1-ft. outside	0.027	280	840	2,520
Track and 1½-ft. outside	0.029	256	768	2,304
Track and 2-ft. outside	0.032	234	702	2,106
Track and 3-ft. outside	0.037	204	612	1,836
Track and devilstrip	0.047	160	480	1,440
Track and devilstrip and 1-ft. outside	0.052	145	435	1,305
Track and devilstrip and 1½ ft. outside	0.054	138	414	1,242
Track and devilstrip and 2-ft. outside	0.057	131	393	1,179
Track and devilstrip and 2½ ft. outside	0.060	126	378	1,134
Track and devilstrip and 3-ft. outside	0.061	122	366	1,098

Sand	Tons per foot	One Pocket 7½ tons	One Car 22½ tons	One Train 58½ tons
Grouting track and 2-ft. outside and plastering rail,	0.041	183	549	1,647
Grouting track, devilstrip and 2-ft. outside and plastering rail,	0.045	166	498	1,494
Cement	Sacks per foot			
For grouting and plastering rail,	0.326			

Part of Roadbed	Tons per foot	Required for number of feet of track listed One Pocket 6½ tons	One Car 19½ tons	One Train 58½ tons
Coarse Slag				
For trench 9 ft. 6 in. x 10 in (rolled)	0.292	22	67	201
For trench 19 ft. 0 in. x 10 in. (rolled)	0.584	11	33	100
Fine Slag		7½ tons	22½ tons	67½ tons
For tamping ties (single track)	0.102	74	221	662
For tamping ties (double track)	0.204	37	110	331
Gravel		10 tons	30 tons	90 tons
For concreting first track and 2 ft. outside	0.229	43	129	387
For concreting second track and 2 ft. outside	0.279	36	108	324
Cement	Sacks per foot			
For concreting first track and 2-ft. outside	0.825	36 sacks for 43 feet 108 sacks for 129 feet 324 sacks for 387 feet		
For concreting second track and 2-ft. outside	1.000	36 sacks for 36 feet 108 sacks for 108 feet 324 sacks for 324 feet		

Chart Helpful in Organizing Work

Using the graphic chart as a guide, the summary of all proposed work, shown in Table I, was next compiled. Table II shows the equipment and labor which our preliminary study indicated to be necessary for the various track operations, and this schedule was the basis for the determination of the detailed or working schedule, a sample of which is shown for one track section in Table III.

This last step in the scheduling operations is the most important in the entire scheme, for it fixes the organization and equipment assignment for each day's operations. A copy of it is given to the general foreman in charge of the work and to the superintendent in direct charge of the assignment of equipment, as well as the general supervisory force. The track foreman keeps his copy with him at all times and is continually referring to it in connection with his work. As a further aid to the foreman in ordering his track materials and to enable him to better control the amounts of the various items so as to avoid over or under shipments to the job, the information shown in Table IV was compiled. It has been found to work out very closely to actual requirements.

Planning and Scheduling Permits Most Efficient Use of Equipment

Much has been accomplished by this method of planning and scheduling. In the first place, the scheme has enabled us to utilize our equipment to the maximum degree of efficiency, through an accurate knowledge of when a given piece of machinery would be finished on one job and when the next would be ready for a unit of the same kind. Next, it has enabled us to control our unit labor costs on the various track construction operations and to keep them within reasonable limits as between the various jobs. It has made possible an accurate scheduling of the delivery of track materials over a period of months instead of in a lump shipment, thus minimizing the investment in the material account at any one time and distributing the disbursements for such materials to much better advantage. It has further been responsible for a marked improvement in the supervision given to work by the various general foremen, each one being keen to meet or better the requirements of his schedule, either in the matter of elapsed time or in number of men required to accomplish the desired result within the time specified. Of course, all foremen are not equally efficient, but with their daily work schedule planned in advance for them and with the other aids which this plan provides them, there is a much better chance of securing a reasonable degree of uniformity in the results obtained.

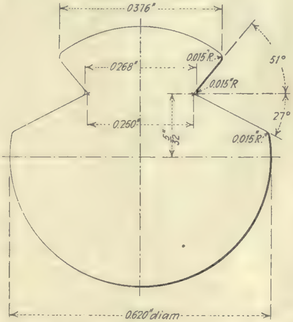
Labor Costs Reduced 37 Per Cent

Reducing these generalties to actual, tangible figures, there resulted a saving in labor costs per lineal foot of slightly more than 37 per cent over the costs for the average for the previous two years, during which the same track construction standard had been in use, and 27 per cent saving over the weighted average costs for the preceding ten years. In neither comparison is any allowance made for differences in types of construction in use during the various years, although that in use since 1928 is materially heavier than the types installed prior to that time. Moreover, no consideration has been given to gradually increasing labor rates over the period in question.

The goal which we set out to accomplish for the first year's trial of this method of handling our work was exceeded, although after carefully watching results being obtained, we now feel that the plan offers still further possibilities in the way of labor saving. Our work schedules for 1931 will, of course, be revised to conform to the best results accomplished during the season just passed, and while this may necessitate some of the foremen stepping just a little bit faster in order to keep up to the mark, we feel sure that we are not planning to ask the impossible of any man and that it is highly desirable to set a standard something just a little higher than the average. In this way your foremen have something to strive for, and it is our expectation that even our best records for low labor costs in 1930 will be bettered in 1931.

New Standard Trolley Wire of Heavy Section

DEMAND for a trolley wire of heavier section than the No. 0000 size regularly used in the past has led the American Society for Testing Materials, in conjunction with the American Electric Railway Association and other interested groups, to undertake the standardization of this heavier section. This demand originated with the electrified mine railways and the electrified steam railroads. Some companies had these heavier wires drawn on special order in figure 8 section, some in grooved section, and some in other special shapes of a capacity approximating No. 000000 B. & S. gage if extended to embrace this size. These special wire sections caused considerable trouble and confusion owing to the difficulty of securing overhead fittings to accommodate the different sections.



Standard for large current capacity trolley wire to eliminate special types

The heavy section recommended is of 350,000 circ. mil cross-section, which is slightly larger than the theoretical No. 000000 B. & S. gage. Actual area in square inches is 0.27575, and calculated weight per mile from measured area is 5,612 lb. The top lobe of the new wire is like the present No. 0000 grooved section so that trolley clamps and ears are interchangeable. The wire has the advantages of large carrying capacity, large wearing area and large contact surface for the trolley wheel. It is of circular contour so that the tendency to kink is eliminated. The use of the new standard wire is recommended wherever trolley wire larger than No. 0000 is desired.

Comments on th

The statement of principles for American business appears to me to contain constructive and helpful suggestions for the future. I believe that you have touched many of the fundamentals of the problem, and the publication of your statements should, therefore, prove especially helpful in bringing about a clearer general understanding of our problems.

F. R. Phillips,
President,
Pittsburgh Railways

▼

I have read over carefully McGraw-Hill's statement of principles for American business, and am in entire accord with it.

J. H. Hanna,
President.
Capital Traction Company

▼

It is my opinion that anything that stimulates thinking along such lines is of value and can be of great import over the next few years. Selling the idea that a permanent lesson should be learned from the current depression is certainly sound and necessary. There were those who thought at one time, after September, 1929, that within six or eight months business might bound back again to levels even higher, although we may feel thankful that this did not occur. Of course, in the light of what has happened, it could not possibly have occured. It seems to me you are accepting responsibility of the business press in a very fine way.

Edward Dana,
General Manager,
Boston Elevated Railway

▼

I think your publications are doing a very constructive piece of work of national importance in putting this platform before the business men of America.

G. A. Richardson,
Vice-President,
Chicago Surface Lines

▼

Theoretically, I think your plan has great merit and represents, from an economic standpoint, a great stride in the solution of this problem of periodic prosperity and depression.

Its weakness is, I believe, the difficulty, if not impossibility, of securing the co-operation to carry it through. Your plan is based solely upon the voluntary acceptance and action by business interests. Against such voluntary action there will always be a more compelling motive of self-interest on the part of that group which finds it profitable to disregard the limitations which your plan imposes, and engages in a ruthless competition of under-selling.

As I interpret it, the key word of your program is "stabilization," and while, in the long run, this means lowest costs, yet it frequently involves higher costs than will occur temporarily for those businesses that disregard the limitations imposed.

As a campaign of education, I think, your recommendations are very good, but I believe more vital and fundamental issues must be attacked if the succession of economic cycles is to be overcome.

Jos. H. Alexander,
President,
Cleveland Railway

▼

I subscribe heartily to the plan. It does seem most shortsighted that the nations of the world should go stumbling along without a plan, Micawber-like, hoping for something to turn up. One thing for which the Soviet Government should have credit is that they have a plan. True, it may be "all wet," but, at least, it is a plan, and they seem to have sold it to their workers. It is gratifying to know that your great organization is alive to this situation and is setting about in a business-like way to assist in bringing order out of chaos.

John A. Beeler,
The Beeler Organization

▼

The statement of principles for American business is very timely and valuable. Every manager who intends to get the most out of his business must take your check sheet up item by item and bang away at it day after day. I would like to congratulate the McGraw-Hill Publishing Company on its leadership in preparing and promulgating these principles.

J. A. Emery,
Vice-President,
Ford, Bacon & Davis, Inc.

I have read with much interest the statement of principles of American business, which strikes me as sound, logical and convincing.

Powell C. Groner,
President,
Kansas City Public Service Company

▼

Nothing is more needed today than an analysis with its resulting recommendations such as the "Platform for American Business." As civilization continues to progress, the justification for the existence of private business will depend entirely upon whether or not it proves clearly its ability most adequately to promote the general welfare of mankind and to offer the fullest opportunity for "life, liberty and the pursuit of happiness."

Our government is founded on the principle that all men are born free and equal. This statement is true if not misinterpreted. Yet, unfortunately, we know that all men are not born equal as regards morals, health and mental capacity. If they were, an altruistic communistic system would be most desirable, but it is apparent that such is not the case, and under the actual, existing conditions some broadly and fairly devised social system that rewards private initiative and desirable individual accomplishment must prove most likely to improve the condition and happiness of mankind with greater speed than would otherwise be possible.

I am, therefore, convinced that fundamentally the American capitalistic system, if it can be shorn of abuses and undue selfishness, is most practically desirable, and, further, I subscribe most heartily to the soundness of your four major premises. On the other hand, I cannot help feeling that our present difficulties and many others in the past have been caused by the human tendency of capitalists to sometimes increase their individual fortunes and promote their personal financial advancement in a manner economically and sometimes ethically unsound, just because it appeared to them expedient at the moment. As a class, they frequently lose sight of the fact that the justification of the privi-

BUSINESS PLATFORM

Prominent executives of the electric railway industry express favorable opinions of the plan outlined in the supplement to the March issue of *Electric Railway Journal*. Extracts from their letters are given here

leges they possess rests on the fact that the benefits accruing from the operation of the system will be fairly divided between the capitalist and the consumer. These abuses may take the form of speculative gains, undue profits, sale of unsound securities or what not.

Now, it seems to me, that the successful continuation of the capitalistic system depends upon the ability of its leaders to win the sincere public confidence that it is being operated fairly and unselfishly for the general benefit of all whose interests are involved, the employer, the consumer as well as the investor. This public confidence can be permanently won only when it is well merited.

In the last paragraph you have pointed out that the United States must win the confidence of foreign nations in our business system by sharing with them the benefits accruing from international trade, while I am stressing that our capitalistic system by the same token must win the confidence of our proletariat by sharing the benefits of our system fairly with them.

W. E. WOOD,
Vice-President,
Engineers Public Service Company, Inc.

▼

I realize the importance to the future of American institutions that there be developed an attitude and a practice toward the problems discussed. It seems to me that it is going to be most difficult to develop such an attitude and I realize that is no alibi for even a postponement of such an effort.

It seems to me that probably there would have to be modifications in the details of such a plan as you propose, which modifications can only be developed by discussions.

I have discussed your letter with some of our business men and have wondered whether the development of such a business plan might not be crystallized best as the result of talks before various civic associations, Chambers of Commerce and other lunch clubs which are in existence in every city in the country. If anything is to come of such a plan it would seem to me that it must be because its discussion is kept alive as a matter of public interest.

RANKIN JOHNSON,
President,
Trenton Transit Company

▼

In the main your proposed statement of principles for American business strikes me as being sound, progressive and as definite as principles need to be. Their one fault—if it is a fault—is an absence of practical motivation. The general welfare alone is not enough to stir most business men to action. Self-interest is so large a factor in business that its importance is almost always stressed ahead of the general welfare when the two threaten to conflict.

Of course, the conflict is frequently more apparent than real—as when the business man thinks he profits by having the government engage in someone else's line of business, not realizing that it may eventually engage in his own. The long look ahead, which your platform inculcates, may serve to overcome such economic shortsightedness, and thus energize the platform itself by showing how closely the general welfare affects each line of business. The present depression has undoubtedly driven home some of that lesson already.

L. A. DOWNS,
President,
Illinois Central System

▼

Generally speaking, these principles are directed to productive industries, and, while we in the transportation game are really producing something the public should buy, the restrictions of governmental regulations and the pressure of public demand modify to a very large degree any general statement as to sound principles.

There is one particular phase of your presentation with which I am in hearty accord—that is, the necessity for methodical planning for future periods, coupled with intensive immediate budgeting. If there was some way whereby officials of transportation companies could have impressed upon them the necessity for such vision, we would observe an immediate improvement in transportation affairs, but the intensive demands of the present are so great, and have been for so long a period of time, unfortunately most executives have lost sight of the necessity to have a long-distance target at which to shoot.

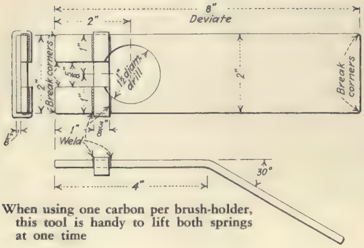
LUCIUS S. STORRS,
President,
United Railways & Electric Company

▼

Am glad to see an awakening to the menace of government's invasion of the field of private enterprise and the value of long-range planning. The circulation you are giving this "platform" will add to the value of its practical suggestions.

PAUL SHOUP,
President,
Southern Pacific Company

PRACTICAL IDEAS for the *Maintenance Man*



When using one carbon per brush-holder, this tool is handy to lift both springs at one time

Lifting Two Brush Fingers with One Motion

By John S. Dean
Special Engineer
Westinghouse Electric & Manufacturing Company

MANY railway operators use one large carbon per brush-holder instead of two small carbons. They claim there is less side wear on the single large brush which results in longer brush life. With the adoption of the single carbon per holder, it is necessary to lift both of the pressure fingers on the brush-holder at the same time to inspect or change carbons. To make this work easier for the motor inspector, a special brush-finger lifting device has been developed, and is being successfully used on a number of railway properties. This lifter, which is shown in the illustration, can readily be made in the shop by the machinist or any handy man at very little expense.

*Repair of Broken Rail Heads**

By F. W. Drowley
Roadmaster
Toronto Transportation Commission

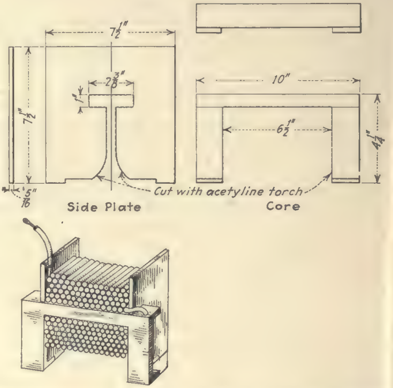
WHEN rail joints fail by breaking along the fillet under the head, and the balance of the rail is in good condition, they can be repaired satisfactorily by welding. This method avoids cutting in a new piece of rail and therefore adding a joint to the track.

How broken rail heads at joints are prepared for building up by welding

The rail head on each side of the break is cut off at an angle of 45 deg., as shown in the illustration. The head is then built up by welding with low carbon rods, beginning at the splice bar and the rail ends and laying the metal to within ¼ in. of the top of the rail. At this point high carbon rods are used to provide a good wearing surface. This method of building up broken rail heads may be used with both the plain and grooved girder rails. The rail shown in the illustration is the Lorrain section 90-471.

*Good Ground Connection for Electric Track Tools**

By Farrell Tipton
Electrician
San Diego Electric Railway



Improved performance of track maintenance power equipment has been noted since this magnetic ground contactor has replaced the iron block contactor on the San Diego Electric Railway

MAGNETIC rail contacts have been adopted by the San Diego Electric Railway for track equipment operating from the trolley wire. These replace the unsatisfactory iron blocks which often made poor ground contacts and were easily jarred from the rail by the vibration of track machinery, causing unnecessary interruptions to the work going on.

The magnetic ground contactor is made from a section of rail cut to U shape with the opening at the base of the section and the head continuous, as shown in the illustration. This rail section forms part of the core of the magnetic circuit when power is drawn from the trolley; the rail in the street completes the magnetic circuit. Welded to each leg of the core is an iron plate, 7½ in. x 3¾ in. x $\frac{5}{16}$ in. The core is wound with 40 turns of No. 6 flexible round copper wire, one end of which is soldered to the core and the other is clamped and insulated from one of the plates. The latter end serves as a terminal to be connected to the negative lead of the equipment. The magnetic contact is placed upon the head of the rail, similar to the manner of placing the iron block, and when the power circuit is closed the magnetic contactor is held firmly to the rail by the magnetic effect of the coil. The magnetic attraction between the core and the rail is great enough to assure a good ground connection.

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*Submitted in Electric Railway Journal Prize Contest.

*Run-off Clamps**

By E. B. Spenzer
Way Department Cleveland Railway

Steel clamps are bolted to the rail webs on run-offs of portable track used by the Cleveland Railway to prevent jumping and creeping. These clamps are attached to the run-off rails of the portable crossovers or turnouts about 5 ft. from the points, as shown in the illustration. When in use they grasp the head of the lower rail, and when not needed they can be turned up out of the way along the web of the run-off rail. The clamps are made from ½-in. cold-rolled steel and are drilled for bolting them to the web of the run-off. They have an over-all length of 4⅝ in.

In straight track construction, where we use portable side tracks, run-offs are placed at 500-ft. intervals to act as expansion joints. At these points the clamps are

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Scope of Maintenance Contest *Broadened*

Company Trophy to Be Awarded on Basis of General Excellence in Maintenance Work—Presentation to Be Made at Atlantic City in October

With the idea of broadening the scope of Electric Railway Journal Maintenance Contest, it has been decided to base the company award in 1931 upon data showing the general character, quality and cost of the maintenance work done by the various companies in the industry during the calendar year 1930. The contest committee has subdivided the subject into ten topics, under each of which it is requested that data be submitted. From this information, the judges will be able to make a comparison of the results being accomplished on a large number of properties.

The ten topics to be considered are listed in a letter being sent out to all operating companies in the United States and Canada. Replies will be considered as confidential if desired. The judges have endeavored to simplify their request for information to the greatest possible extent consistent with securing an accurate picture of the maintenance work being done on the various properties. It is hoped that the simplicity of the arrangement will encourage the participation of a large number of railways. Data should be sent to the chairman of the committee, in care of the American Electric Railway Engineering Association, 292 Madison Avenue, New York City. The closing date for receiving material is July 1, but it is hoped that figures will be submitted as early as possible so that the judges may have ample time to go over the large number of reports upon which their conclusions will be based.

As in previous years a handsome trophy will be presented to the winning company. Presentation will be made at Atlantic City in October, during the 50th Annual A.E.R.A. Convention.

Following is a summary of the data desired by the judges:

EQUIPMENT

1—(a) Cost of car maintenance per car-mile.
(b) Cost of bus maintenance per bus-mile.

2—(a) Total car-miles operated during 1930.
(b) Average car-miles per pull-in.
(c) Total bus-miles operated during 1930.
(d) Average bus-miles per pull-in.

—(a) Per cent of total active cars overhauled during year 1930.
(b) Per cent of total active buses overhauled during year 1930.

—(a) What are the bases of car inspection, of overhaul, of painting and of general cleaning?
(b) What are the bases of bus inspection, of overhaul, of painting and of general cleaning?

5—(a) What is the average age of cars in service?
(b) What is the average age of buses in service?

TRACK

6— Cost of track maintenance per car-mile.

7—(a) Total mileage of open track.
(b) Percentage of open track reconditioned during the year 1930.
(c) Total mileage of paved track.
(d) Percentage of paved track reconditioned during year 1930.
(e) Mileage of track completely reconstructed.
(f) Mileage of new rail laid.
(g) Number of new ties installed in open track.

8— Give a brief summary of track maintenance work done.

OVERHEAD LINES

9— Cost of overhead line maintenance per car-mile.

10—(a) Trolley wire breaks per thousand car miles.
(b) Trolley wire breaks per thousand kilowatt-hours energy consumed.
(c) Per cent of trolley wire renewed during year 1930.

GENERAL

Description of improvements made during year in maintenance methods or equipment.

Clamps placed near the points of run-offs are considered necessary for safe operation

considered necessary for safe operation. Crossovers can be placed on long radius curves without having the run-offs kick off gage. In our experience, we have found that the clamps are almost as necessary for safe operation on run-offs as are tie rods.

Clearing the Right-of-Way for Traffic

ROADBED maintenance and snow removal will be the duties of a 53-ton spreader and ditcher recently added to the equipment of the Chicago, South Shore & South Bend Railroad. The unit can be used for digging ditches, spreading ballast, leveling banks and shaping the roadbed. In fighting snow and ice it will clear a path 32 ft. wide through snow banks, and remove ice and snow from the flanges of the rails.

The spreader is pushed by a locomotive at a speed of 10 to 15 m.p.h., cutting through ballast or snow with a V-shaped plow. Large wings, which extend from each side, will level material or remove snow from the tracks. Movable wire brushes under the plow clean the rail flanges and sweep the tracks.

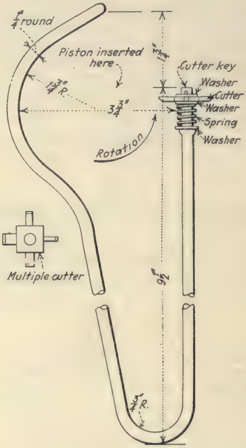
The wings, plow and brushes are controlled by compressed air stored in large tanks behind the control cabin. When fully extended, the left wing reaches 22 ft. from the center of the track, and the right wing 10 ft. O. F. Jordan Company, East Chicago, Ind., built this spreader.

Piling snow along the right-of-way. At right, the plow is doing a good job clearing snow away from the rails

*Piston Ring Groove Cleaner**

By Charles Herms
General Foreman
San Diego Electric Railway

FOR cleaning grooves of piston rings a multiple cutter scraper has been developed by the San Diego Electric Railway. This scraper has four tool-steel cutters of different widths which cover nearly all standard sizes of piston grooves. To clean piston grooves of a given size the proper cutter is selected and inserted in the groove. After turning the scraper several times around the piston the grooves will be cleaned satisfactorily. The spring below the cutters serves to prevent them from chattering or turning. Satisfactory results have been obtained with this type of scraper.



A groove scraper with four tool-steel cutters and fitted with a convenient handle is used in the bus shops of the San Diego Railway

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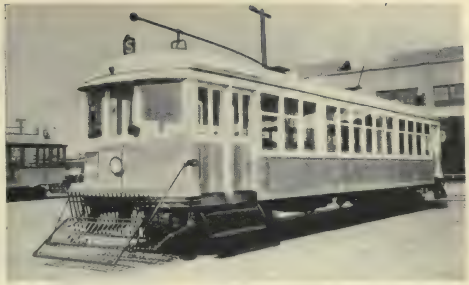
*Submitted in Electric Railway Journal *Prize Contest.*

Cars of the Los Angeles Railway formerly with open end sections have been made fully inclosed



Los Angeles Completes Program of CAR RECONSTRUCTION

RECONSTRUCTION of 25 additional cars from its Type H to the Type H-3 has recently been completed by the Los Angeles Railway, Los Angeles, Cal.

The Type H is a double-end, two-man, four-motor, multiple-unit, end-entrance steel car arranged with open end sections and an inclosed center section with bulkhead doors. These cars weigh 42,000 lb., and are equipped with 26 wooden Walkover seats for 52 passengers. They are painted with the Los Angeles Railway standard colors of brown and yellow.

Major changes made consisted of equipping the cars throughout with metal sash, making them entirely inclosed. A sun visor was placed at each end. The old standard route sign was replaced by a Hunter sign, and the cars were repainted to have a brown roof, cream color finish above the window sills and a green below. The motor gears were provided with sound absorbing rings, and the wheels with pads. Pads were also used in other parts of the car to reduce noise and vibration.

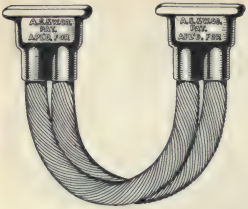
Interior appearance was materially improved by a three-ply birch veneer headlining, finished in cream color. The old lighting arrangement of four circuits of five lamps in series was replaced by two circuits of twenty lamps in series, using the new 30-volt 46-watt lamp. A pleasing type of dome fixture with inside frosting was adopted. The new lighting arrangement provides 28 lamps for interior car lighting; the remaining lamps are used for signs and step lights. The wooden seats were replaced by Heywood-Wakefield leather upholstered Walkover seats with a bright green color and a swirl grain. Five ventilators were placed in each vestibule above the windows and arranged with hinged doors and screen mesh so that the air might be regulated by the trainmen. It was necessary to install additional roof ventilators for the end sections similar to the standard dome type used in the center section.

Pleasing interior trim and leather seats have improved appearance and comfort

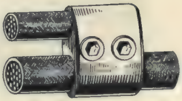
Detail Specifications of Los Angeles Reconstructed Cars

Name of Railway	Los Angeles Railway Corporation
Number of units	25
Type of unit	Two-man, motor, passenger, city, double-end, double-truck
Number of seats	28
Weights: car body	23,500 lb.
Trucks (each)	6,110 lb.
Motors, electrical and air equipment	9,680 lb.
Total	45,400 lb.
Bolster centers	31 ft. 0 in.
Length over all	48 ft. 0 in.
Length over body posts	44 ft. 0 in.
Truck wheelbase	5 ft. 9 in.
Width over all	8 ft. 3 in.
Height, rail to trolley base	11 ft. 8 in.
Window post spacing	30 in.
Body	All steel
Roof	Arch
Doors	End, folding
Air brakes	Westinghouse SME
Armature bearings	Sleeve
Axles	A.E.R.E.A. Standard 5-in. heat-treated
Car signal system	Faraday and single stroke bell
Compressors	Westinghouse DH-16
Conduit	Metal
Control	Westinghouse HL
Couplers	Westinghouse automatic, K1-A
Curtain fixtures	National Lock Washer Co.
Curtain material	Pantasote, 86-86 D.F., grain 5
Destination signs	Hunter 9-in. type 118
Door mechanism	St. Louis, hand operated
Energy saving device	Economy meter
Fare boxes	Johnson
Fenders	Eclipse style C
Finish	Sherwin-Williams enamel
Floor covering	Industrial Karpet
Gears and pinions	Westinghouse helical
Glass	Libby-Owens DSA, $\frac{3}{16}$-in. non-shatterable in folding doors
Hand brakes	St. Louis
Headlights	Golden Glow type SM-95
Headlining	Birch veneer, 3-ply
Interior trim	Bass-Hueter varnish, cherry ceiling, Fuller's light cream enamel
Journal bearings	Sleeve
Journal boxes	Los Angeles Railway
Lamp fixtures	Safety Car Heating & Lighting Co., No. T, 29420; two circuits of 20 lamps each
Motors	Four Westinghouse 514-L, inside hung
Motorman's mirrors	Two rear view
Painting scheme	Green, cream and brown
Roof material	T. & G. poplar $\frac{7}{8}$x$1\frac{3}{4}$ in., canvas covered
Sash fixtures	Adams & Westlake "Rex"
Seats	Heywood-Wakefield No. 327-M, special
Seat spacing	$29\frac{1}{2}$ in.
Seating material	Green leather
Steps	Stationary
Step treads	Stanwood and Safkar
Trolley catchers	Ohio Brass Co.
Trolley base	US 13-E
Trolley wheels	Kalamazoo and More-Jones
Trucks	Commonwealth type M-69
Ventilators	St. Louis, dome type
Wheels	Rolled steel, 30 in. diameter

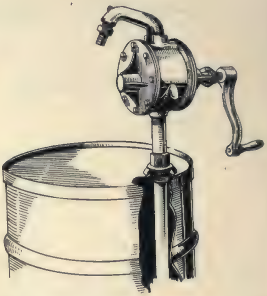
New Developments in Railway



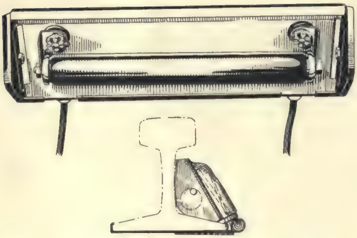
Power bond with flash butt-welded solid soft steel terminals is equally suitable for flame or arc welding. The wires are intimately welded to the terminal, and the full cross-section of the conductor maintained through entire length. This is said to prevent abrupt deformations which concentrate the vibratory stresses. Manufacturer: American Steel & Wire Company, Chicago, Ill.



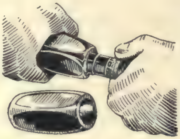
Connector, known as Panel-Gutter Tap, is useful for making cable splices quickly. It is of two pieces which are clamped to the cable with socket screws that are set flush with the surface. The screws are tightened with a wrench. Manufacturer: Frankel Connector Company, New York.



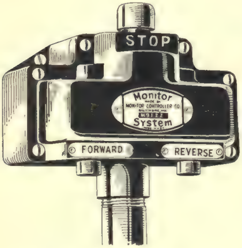
Hand rotary pump for transferring gasoline from steel drum will deliver 12 gal. per minute at 100 r.p.m. It has a 42 in. suction pipe, which screws into a case, and a spout fitting into a 1½ in. discharge opening. The spout can be turned at any angle desired. Manufacturer: Geo. D. Roper Corporation, Rockford, Ill.



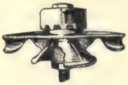
Electric track switch heater is placed directly on the web of the rail. No moving of ballast or cutting of ties is necessary. Standard units have a capacity of 600 watts, and are designed for parallel connection on a 110-volt circuit, or five in series on a 550-volt circuit. Manufacturer: Electric Service Supplies Company, Philadelphia, Pa.



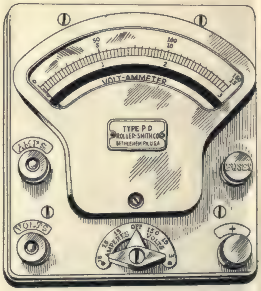
Caps of renewable ferrule fuses can be removed or tightened with one end of this hard wood wrench. One end will fit fuses up to 30 amp., and the other end will fit fuses from 35 to 60 amp. Manufacturer: Jefferson Electric Company, Chicago, Ill.



Ironclad push button master station, for use in either a.c. or d.c. circuits, provides forward and reverse momentary contact control. The forward and reverse buttons are in a protected position at the bottom, and the stop is on top. All fixed contacts and wiring are carried in the base. Manufacturer: Monitor Controller Company, Baltimore, Md.

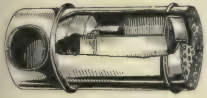


Straight line hangar, known as type CD is recommended by manufacturer for ease of replacing insulating portion. Width of shell has been increased to 3½ in. to prevent arcs between line ear and hangar skirt. Maximum overall length of arms is 6½ in. Manufacturer: Electric Railway Equipment Company, Cincinnati, Ohio.

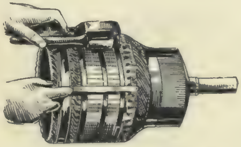


Portable volt-ammeter with selector is available for signal and control testing. It has a 3-150 voltage range and a .15-15. current range. The meter is protected against excess current by a six-point multiple fuse, offered as an extra. Manufacturer: Roller-Smith Company, New York.

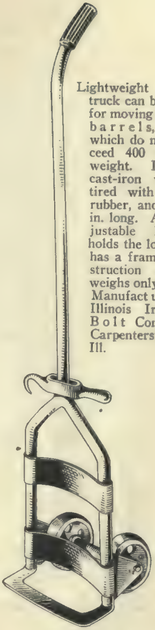
and Bus Equipment



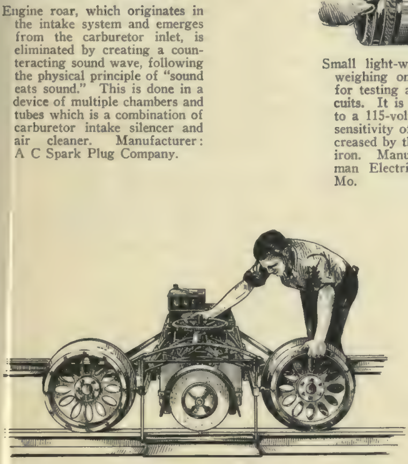
Engine roar, which originates in the intake system and emerges from the carburetor inlet, is eliminated by creating a counteracting sound wave, following the physical principle of "sound eats sound." This is done in a device of multiple chambers and tubes which is a combination of carburetor intake silencer and air cleaner. Manufacturer: A C Spark Plug Company.



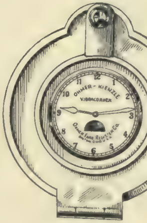
Small light-weight internal growler, weighing only 3½ lb., can be used for testing armatures for short circuits. It is designed for connection to a 115-volt, 60-cycle circuit. The sensitivity of the growler can be increased by the use of a thin strip of iron. Manufacturer: P. E. Chapman Electrical Works, St. Louis, Mo.



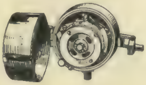
Lightweight hand truck can be used for moving boxes, barrels, etc., which do not exceed 400 lb. in weight. It has cast-iron wheels tired with solid rubber, and is 52 in. long. An adjustable hook holds the load. It has a frame construction and weighs only 27 lb. Manufacturer: Illinois Iron & Bolt Company, Carpentersville, Ill.



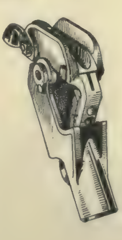
Electric track grinder is equipped with a 3-hp. motor turning at 3,000 r.p.m. Motor shaft is connected by a flexible coupling to main drive which engages a 12-in. grinding wheel through spiral gears. Hand wheel controls feed adjustment of grinding wheel. Grinder can be swung around from one rail to another by hand. Manufacturer: Railway Track-Work Company, Philadelphia, Pa.



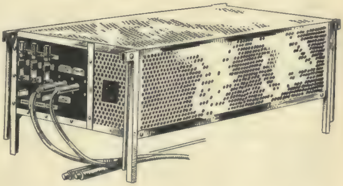
Another recording instrument, known as the Seven-Day Vibracorder, will indicate the exact clock time that any vehicle or machinery is in operation or is idle. A 5-in. paper disk tells the whole story of seven days of operation. The instrument is actuated by vibrations or oscillation always present in any running vehicle or machinery. Manufacturer: Ohmer Fare Register Company, Dayton, Ohio.



Speeds, distance and time elements of all bus and truck movements are recorded on a permanent tape by this Recordograph. The tape has a time axis which gives a continuous graph of vehicle movement. Total distance traveled, maximum speed, running and idle times, as well as when they occur can be obtained. Manufacturer: Ohmer Fare Register Company, Dayton, Ohio.



Trolley slide has removable pack-hardened steel contact insert which weighs 7 oz., and can be replaced in a few minutes. The insert has enough depth to give long service on both interurban high-speed and metropolitan services. For the former service, the shoe is of cast malleable iron, and of bronze for the latter. Manufacturer: Superior Trolley Slide and Equipment Company, Waukegan, Illinois.



Portable electric arc welding machine can easily be carried by two men. It can be connected for 400 to 500-volt or 500 to 600-volt operation with three double-throw single-pole knife switches. When electrode makes contact, welding circuit is completed through a magnetic switch. Manufacturer: Ohio Brass Company, Mansfield, Ohio.

Monthly and Other Financial Reports

	Operating Revenue $	Operating Expenses $	Taxes $	Gross Income $	Net Income $
Market Street Railway, San Francisco, Cal.					
February, 1931.......	668,931	576,061*a*	....	92,870	41,002
February, 1930.......	728,404	628,268*a*	....	160,136	44,224
12 mo. end. Feb., 1931	9,093,431	7,737,485*a*	....	1,355,946	710,679
12 mo. end. Feb., 1930	9,585,605	8,028,102*a*	....	1,557,503	856,289
Northwestern Pacific R.R., Sausalito, Cal.					
January, 1931........	283,852	365,462	36,194	*117,822*	*123,928b*
January, 1930........	362,890	432,834	36,382	*106,400*	*108,007b*
Washington Railway & Electric Co., Washington, D. C.					
January, 1931........	423,443	342,830*a*	....	102,845	47,709
January, 1930........	434,485	351,276*a*	....	109,112	51,619
Jacksonville Traction Co., Jacksonville, Fla.					
January, 1931........	87,160	69,804	8,194	8,648	....
January, 1930........	94,815	80,597	9,271	4,525	....
12 mo. end. Jan., 1931	1,023,621	834,022	91,898	91,546	*58,133*
12 mo. end. Jan., 1930	1,138,597	932,048	108,478	92,045	*66,055*
Honolulu Rapid Transit Co., Honolulu, Hawaii					
January, 1931........	84,247	51,640	8,998	25,686	14,129
January, 1930........	86,856	54,506	8,819	24,776	12,943
Chicago Surface Lines, Chicago, Ill.					
January, 1931........	4,576,133	3,825,964*a*	....	750,169	718,129*d*
January, 1930........	5,239,755	4,043,147*a*	....	1,196,608	909,248*d*
Illinois Terminal Company, Springfield, Ill.					
January, 1931........	509,641	363,355	32,598	113,683	87,742*b*
January, 1930........	643,080	467,549	26,341	149,190	97,309*b*
United Railways & Electric Co., Baltimore, Md.					
February, 1931.......	1,136,604	781,293	110,128	256,220	*24,088e*
February, 1930.......	1,349,311	928,327	132,067	299,482	18,367*e*
2 mo. end. Feb., 1931	2,405,140	1,662,423	223,410	543,747	*16,700e*
2 mo. end. Feb., 1930	2,772,829	1,915,478	273,329	665,494	42,372
Boston Elevated Railway, Boston, Mass.					
January, 1931........	2,840,159	1,948,650	133,806	762,555	57,600
January, 1930........	3,101,063	2,087,830	133,033	891,811	195,210
Eastern Massachusetts Street Railway, Boston, Mass.					
February, 1931.......	639,344	413,321	21,583	216,192	33,058
February, 1930.......	684,616	418,490	29,091	247,197	67,278
2 mo. end. Feb., 1931	1,340,306	858,044	48,941	454,222	69,204
2 mo. end. Feb., 1930	1,443,429	866,775	66,846	529,558	149,734
Holyoke Street Railway, Holyoke, Mass.					
3 mo. end. Dec., 1930	126,894	110,752*a*	....	16,142	*4,583*
3 mo. end. Dec., 1929	168,958	153,154*a*	....	15,804	*4,680*
9 mo. end. Dec., 1930	567,073	503,209*a*	....	63,864	*18,368*
9 mo. end. Dec., 1929	703,744	594,279*a*	....	109,465	26,860
Department of Street Railways, Detroit, Mich.					
February, 1931.......	1,431,468	1,258,333	65,350	115,168	*28,309*
February, 1930.......	1,922,327	1,568,683	65,090	297,112	158,026
12 mo. end. Feb., 1931	20,108,471	17,108,250	774,960	2,281,049	534,465
12 mo. end. Feb., 1930	25,883,821	20,645,509	756,068	4,588,792	2,897,415
Brooklyn-Manhattan Transit System, New York, N. Y.*c*					
February, 1931.......	4,453,655	2,840,152	319,751	1,356,333	583,468
February, 1930.......	4,628,946	3,020,029	340,311	1,339,361	569,829
8 mo. end. Feb., 1931	38,753,154	25,089,541	2,653,144	11,553,474	5,373,282
8 mo. end. Feb., 1930	40,172,997	26,825,506	2,593,973	11,340,666	5,136,488
Brooklyn & Queens Transit System, New York, N. Y.					
February, 1931.......	1,704,077	1,312,106	104,086	302,873	176,217
February, 1930.......	1,775,394	1,383,112	114,014	297,996	171,777
8 mo. end. Feb., 1931	14,848,927	11,552,417	849,282	2,562,970	1,565,237
8 mo. end. Feb., 1930	15,682,526	12,352,785	914,117	2,585,683	1,575,311
Hudson & Manhattan R.R., New York, N. Y.					
February, 1931.......	936,542	467,137*a*	....	469,404	134,717
February, 1930.......	992,769	497,424*a*	....	495,345	161,096
2 mo. end. Feb., 1931	1,941,564	979,487*a*	....	962,076	291,815
2 mo. end. Feb., 1930	2,080,544	1,049,635*a*	....	1,030,818	361,951
Interborough Rapid Transit Co., New York, N. Y.					
February, 1931.......	5,570,354	3,453,960	199,838	1,916,555	*321,587*
February, 1930.......	5,758,313	3,530,575	201,846	2,025,891	*291,455*
8 mo. end. Feb., 1931	46,702,891	30,534,412	2,067,977	14,100,501	*2,490,652*
8 mo. end. Feb., 1930	47,915,484	29,911,581	1,614,802	16,389,100	*1,430,964*
Long Island Railroad, New York, N. Y.					
January, 1931........	2,763,421	2,088,754	121,509	550,127	382,141 *b*
January, 1930........	2,929,253	2,346,899	126,048	456,206	314,950*b*
New York Railways, New York, N. Y.					
January, 1931........	431,602	398,154*a*	....	33,448	*10,493*
January, 1930........	457,586	428,713*a*	....	28,873	*34,242*
New York, Westchester & Boston R.R., New York, N. Y.					
January, 1931........	182,248	137,689	23,110	23,345	*220,394*
January, 1930........	211,322	122,640	24,308	65,093	*166,494*
New York, Westchester & Boston R.R., New York, N.Y.					
February, 1931........	161,311	149,571*a*	....	11,740	*222,308*
February, 1930........	189,794	134,561*a*	....	55,233	*171,766*
2 mo. end. Feb., 1931	343,559	310,370*a*	....	33,189	*442,702*
2 mo. end. Feb., 1930	401,117	281,510*a*	....	119,607	*338,261*
Staten Island Rapid Transit Co., New York, N. Y.					
January, 1931........	170,387	140,982	18,000	11,405	*1,448b*
January, 1930........	188,377	152,249	17,500	18,628	9,879*b*
Cincinnati Street Railway, Cincinnati, Ohio					
February, 1931.......	582,389	394,286	53,874	146,627	29,960
February, 1930.......	....	....	....	....	....
United Electric Railways, Providence, R. I.					
January, 1931........	543,940	467,673	25,923	50,344	372
January, 1930........	627,964	532,221	34,715	61,027	8,610
United Electric Railways, Providence, R. I.					
February, 1931.......	482,566	411,477	25,967	45,121	*4,503*
February, 1930.......	562,951	468,433	34,715	59,803	8,880
2 mo. end. Feb., 1931	1,026,507	879,156	51,889	95,466	*4,130*
2 mo. end. Feb., 1930	1,190,915	1,000,654	64,429	120,829	17,490
Galveston-Houston Electric Ry., Houston, Texas					
January, 1931........	33,291	22,596	2,461	8,233	....
January, 1930........	41,659	24,921	2,658	14,078	....
12 mo. end. Jan., 1931	492,673	297,394	30,803	164,475	*105,000*
12 mo. end. Jan., 1930	579,366	327,059	32,441	220,058	*49,859*
Galveston-Houston Electric Railway, Houston, Texas					
February, 1931.......	32,281	....	....	9,291	....
February, 1930.......	40,122	....	....	14,676	....
12 mo. end. Feb., 1931	484,832	....	....	159,090	*111,369*
12 mo. end. Feb., 1930	572,913	....	....	215,580	*52,989*
Houston Electric Company, Houston, Texas					
January, 1931........	242,554	154,773	22,019	65,766	....
January, 1930........	271,140	175,685	23,422	72,033	....
12 mo. end. Jan., 1931	3,064,229	1,926,553	263,943	878,318	518,843
12 mo. end. Jan., 1930	3,365,662	2,080,284	271,848	1,028,328	630,539
Houston Electric Co., Houston, Texas					
February, 1931.......	223,256	....	....	60,007	....
February, 1930.......	259,883	....	....	72,268	....
12 mo. end. Feb., 1931	3,027,602	....	....	861,471	507,328
12 mo. end. Feb., 1930	3,360,971	....	....	1,015,186	635,647
North Coast Transportation Co., Seattle, Wash.					
January, 1931........	172,765	152,133	9,868	10,701	....
8 mo. end. Jan., 1931	1,601,423	1,232,787	72,632	296,002	187,167
Calgary Municipal Railway, Calgary, Alta.					
January, 1931........	70,881	47,295	....	23,586	*2,389*
January, 1930........	99,705	54,199	....	45,506	19,791
Edmonton Radial Railway, Edmonton, Alta.					
January, 1931........	70,020	46,094	....	23,925	495
January, 1930........	85,235	53,022	....	32,213	2,327
British Columbia Electric Railway, Vancouver, B. C.					
December, 1930......	1,257,229	813,579	....	443,650	....
December, 1929......	1,255,522	934,286	....	321,236	....
6 mo. end. Dec., 1930	7,342,950	4,724,483	....	2,618,467	......
6 mo. end. Dec., 1929	7,251,473	4,983,833	....	2,267,640	....
Ontario Hydro-Electric Railways, Essex District, Windsor, Ont.					
November, 1930......	66,354	63,532	465	2,356	*21,172*
November, 1929......	....	....	....	....	*9,442*
Windsor, Essex & Lake Shore Ry., Windsor, Ont.					
November, 1930......	14,225	14,927	165	*537*	*916*
November, 1929......	....	....	....	....	....
Regina Municipal Railway, Regina, Sask.					
12 mo. end. Dec., 1930	398,684	280,536	....	118,148	*56,766*
12 mo. end. Dec., 1929	431,407	262,254	....	169,153	27,631
Saskatoon Municipal Railway, Saskatoon, Sask.					
12 mo. end. Dec., 1930	370,649	253,898	14,502	102,248	*15,163*
12 mo. end. Dec., 1929	....	....	....	....	14,326

Italic figures indicate deficit. *a* Includes taxes. *b* Net after rents. *c* Includes Brooklyn & Queens Transit System. *d* Residue receipts after joint account expenses, federal taxes and city's 55 per cent. *e* After interest on income bonds. *f* After Manhattan dividend rental payable if earned.

NEWS *of the Industry*

LATE NEWS

Omaha, Neb.—President Shannahan of the Omaha & Council Bluffs Street Railway is considering the installation of one-man cars in Omaha. For some time remodeling of cars has been undertaken with that prospect in view. Plans being considered call for a gradual adoption if that is the final decision.

◆

Evansville, Ind. — On Friday, March 20, week-end excursions were put into effect to all points on the division's line, the Evansville & Ohio Valley Railway, operating rail lines to Owensboro, Ky., Rockport and Grandview, Ind., and bus lines to Henderson, Ky., and Tell City, Cannelton, and Mount Vernon, Ind. In addition to the excursions, schedules were changed on cars going to Owensboro in an effort to facilitate connections with trains.

◆

High Point, N. C.—The North Carolina Public Service Company, following its agreement with the city recently to operate buses here for ten years, has removed the overhead on Main Street, except that needed for the use of the electric switch engine in serving the factories.

◆

Chicago, Ill.—The blizzard that swept over the Middle West on March 7 and 8 cost the electric railway companies of Chicago in excess of $500,000. Accountants for the Chicago Surface Lines compute snow removal and extra help at $450,000, and the elevated lines state their costs to be more than $50,000.

◆

Johnson City, Tenn.—Schedules and routes for the new city bus lines are now being worked out by the Johnson City Traction Company. In general the buses are following the routes of the former rail lines with the exception of the down town districts. The company says several weeks will be needed to work out schedule and route details after which the bus lines will be officially put in service succeeding the rail operation.

◆

San Jose, Cal.—Permission has been granted by the railroad commission to San Jose Railroads and Peninsular Railway to abandon service and to remove tracks on Willow Street in San Jose and Willow Glen between McClellan Avenue, San Jose, and Lincoln Avenue, Willow Glen, upon condition that the Peninsular Railway provide service over its track comparable with that now furnished by San Jose Railroad on track to be abandoned.

◆

Honolulu, Hawaii — The Honolulu Rapid Transit Company has submitted plans to the Board of Supervisors for approval of railway improvements involving 5,216 ft., of double track in the business section of King Street and a section of Kalakaua Avenue, to cost about $80,000. It is planned to start work about June 15.

(Late News Continued on Page 220)

Association Discusses Fiftieth Meeting Program

Progress of the work of numerous committees was reported to the executive committee of the American Electric Railway Association at a meeting in New York on March 20. The program for the 50th annual convention, to be held at Atlantic City, Sept. 28 to Oct. 2 was outlined by Edward Dana. Reports of the exhibit, transportation and entertainment committees were presented by F. C. J. Dell.

C. D. Cass, general counsel, reviewed briefly the recent presentation before the Interstate Commerce Commission at Washington of the motor transport case of a group of electric railways. The executive committee indorsed the position taken by these railways as representing the official views of the association.

The executive committee authorized the publication committee to negotiate a new contract for the publication of *Aera* upon the termination of the present agreement. At the request of Chairman J. H. Alexander, the report of the membership committee was presented by F. C. J. Dell. Approval was voted by the executive committee of the application of the Danbury Power & Transportation Company for membership in the association.

Managing Director Charles Gordon, gave an interesting account of the work on car design being done under the auspices of the presidents' conference committee. This was the subject of a recent newspaper release as mentioned in the report of the committee on publicity, presented by Labert St. Clair. Mr. Gordon also called the attention of the committee to the candidacies of J. H. Hanna and J. N. Shannahan for directorships in the United States Chamber of Commerce. Mr. Hanna is the candidate for the third geographical district, while Mr. Shannahan is the candidate in the transportation and communication department.

Work of the committee on fare structures was outlined by Leslie Vickers. Brief reports of other matters were presented as follows: finance, by G. C. Hecker; revision of constitution, by G. A. Richardson, co-operation with state and sectional association, by F. R. Coates; employee relations, by Edward Dana; insurance, by H. B. Potter; manufacturers advisory, by F. C. J. Dell.

The executive committee will meet next at Atlantic City during the annual meeting of the United States Chamber of Commerce in May. The exact date will be decided later.

Coming Meetings

April 8-9—Central Electric Railway Master Mechanics' Association, Hotel Secor, Toledo, Ohio.

April 10—Maryland Utilities Association, Lord Baltimore Hotel, Baltimore, Md.

April 16-18—Annual State Convention, Missouri Association of Public Utilities, Excelsior, Mo.

May 4-7—International Chamber of Commerce, Washington, D. C.

May 14-15—Middle Atlantic States Equipment Men's Association, Washington, D. C.

June 8-11—National Association of Purchasing Agents, Royal York Hotel, Toronto, Ont., Canada.

June 10-12—27th Annual Meeting, Canadian Electric Railway Association, Chateau Frontenac Hotel, City of Quebec, Canada.

Aug. 6-8 — Pacific Claim Agents Association, Stockton, Cal.

Sept. 26-Oct. 2—Annual Convention, American Electric Railway Association, Atlantic City, N. J.

Sept. 28-29—Annual Convention, National Association of Motor Bus Operators, Atlantic City, N. J.

A.E.R.A. Show Applications Ready

Members of the American Electric Railway Association will shortly receive applications for exhibit space at the 50th annual convention and exhibition to take place in the Atlantic City Auditorium, Sept. 26 to Oct. 2 inclusive. Thirty days are allowed for filing. The closing date for the receipt of applications is April 30.

Space will be charged for at the rate of 65 cents per square foot. The official allotment will take place early in May. Willits H. Sawyer, past president of the association, is chairman of the exhibit committee.

This year marks the Golden Jubilee of the A.E.R.A. Manufacture in the railway, motor coach, truck, accessory and tool fields are being requested so to arrange their displays as to embody a historical background. Old equipment will be featured alongside of the modern equipment of today.

Fare Increase in Gary Authorized

The Public Service Commission has granted the petition of the Gary Railways, Gary, Ind., for an increase in fare. Under the new schedule the cash fare will be 10 cents, instead of 8, and tokens, formerly sold at fourteen for $1 will now be sold at six for 50 cents. The petition asked that tokens be sold at the rate of twelve for $1. This feature of the request was altered by the commission.

Harry Sharavsky, special counsel for the city at the hearings before the Public Service Commission, declared that "the commission ignored the appraisal of its own engineers to arrive at its decision." The city threatens an appeal.

LATE NEWS

(Continued from Page 219)

Sacramento, Cal.—Steam and electric railroads operating in California reported to the railroad commission 343 fewer accidents, due to operation, in 1930 than during 1929, with 26 fewer fatalities, and 338 fewer injured. These figures, compiled by the safety division of the commission, do not include grade crossing accidents, which are not due to train operation, and are handled separately.

◆

Rochester, N. Y.—The 1930 agreement covering working conditions for trainmen and bus operators on the New York State Railways in Syracuse, Rochester and Utica, has been renewed for another year, effective May 1, following negotiations between the receivers of the railroad and representatives of the Amalgamated Association. The agreement affects approximately 1,500 men in Rochester, 900 in Syracuse and 400 in Utica.

◆

Annapolis, Md. — The Senate has adopted an amendment to the Frick bill, granting exemption from taxation to the Washington, Baltimore & Annapolis Electric Railroad for two years.

◆

Columbus, Ohio.—The Ohio National Bank has lost its contest against an order of the Public Utilities Commission permitting the Scioto Valley Traction Company to abandon its rail lines between Columbus and Chillicothe and Lancaster. The Ohio Supreme Court has dismissed the error proceedings from the commission brought by the bank. It also dismissed error proceedings brought in the same case by Alex W. Krumm, as trustee, and E. J. Travis. Evidence revealed that the bank did not apply for an order of the commission postponing enforcement of its abandonment order; it did not obtain a court order allowing such a stay, and the tracks connecting the three cities were torn up so that service could not be resumed even if the commission finding was reversed.

◆

Lexington, Ky.—The State Highway Commission has refused the request of the Kentucky Traction & Terminal Company that the State take over maintenance of three joint electric railway and highway bridges. One of these bridges is on the Lexington-Georgetown road and two are between Lexington and Paris. All are being maintained by the railway under a contract entered into 28 years ago by the company with the counties. The request was rejected on the ground that the constitution forbids the state to assume private liabilities.

◆

Harrisburg, Pa. — Plans announced some time ago by the Valley Railways to abandon its service to four cross-river towns and replace it with bus lines operated by the Valley Transportation Company, its subsidiary, have been laid before the Public Service Commission. If the commission approves, the company will abandon rail service and remove its tracks from routes specified in detail. The company in its applications says that it will be ready to start the bus service as soon as commission approval is granted.

Columbus, Ohio — The American Electric Securities Corporation, New York, has acquired control of the Scioto Valley Railway & Power Company, having bought stock through Columbus brokers for months. The purchase will mean no change in operation. The Scioto company serves about 50 suburban communities in south central Ohio with electric current. Its railway lines were abandoned on Oct. 1, 1930. Simultaneously with the announcement of the purchase of the Columbus concern, the Ohio Supreme Court ruled against the Ohio National Bank, which had asked for a reversal of the order of the Public Utilities Commission permitting the Scioto Valley to abandon its rail lines between Columbus and Chillicothe and Columbus and Lancaster.

◆

Cleveland, Ohio.—Discontinuance of the Carnegie Avenue motor coach line has been asked by the Cleveland Railway in a resolution submitted to the City Council, on the grounds of economy. Under the resolution, the buses would continue to operate on the West Side, but the line would terminate at Prospect Avenue Southeast and East Eighteenth Street. The line now operates from West 117th Street to Cedar Road and East Boulevard. Some time ago the railway withdrew double-deck buses from this route.

◆

Detroit, Mich.—Steady retrenchment by the Department of Street Railways has resulted in the dismissal of 252 employees since December, 1930. The reorganization is being carried out with the knowledge and approval of Mayor Murphy, who is quoted as saying that the task has been "absolutely necessary to place the system on a business basis and save it from financial ruin." The most recent group layoff affected fourteen employees of the auditing division. At the Highland Park shops approximately 75 men have been dismissed because of curtailment of work.

The Business Outlook

CONVALESCENCE of business has been a bit disturbed this week by renewed rumbling of political rumpuses here and abroad. Politically pessimistic, but fundamentally favorable for business readjustment is the threatened revival of farm relief agitation by the Farm Board's abandonment of price pegging. The row over the German-Austrian effort to translate French rhetoric into reality, however, exposes again to political eruption the volcano upon which European economic stability is precariously perched and clinches the conviction that American business recovery must come from the cultivation of our own cabbage patch. Governor Norman's visit here holds some hope of international action on a scale comprehensive enough to overcome the credit crisis which uncontrolled price deflation has precipitated. Domestic developments are still dubious, indicating that confidence in continuous recovery or initiative in the adventure of creating new wealth is still crippled by the paralyzing pressure of the deflation complex.—*The Business Week*

◆

East Chicago, Ind. — Efforts of the Chicago, South Shore & South Bend Railroad to condemn a right-of-way along the Grand Calumet River here were upheld by Judge Norton in the Circuit Court of Lake County when he over-ruled all objections of the Indiana Industrial Land Company and other defendants in the action brought by the railroad. Judge Norton appointed three appraisers to determine how much the South Shore should pay the property owners for the use of the land as part of the plan to move its tracks from the main street. The removal will speed up service between Gary and Chicago as well as between South Bend and Chicago.

◆

Harrisburg, Pa.—Speculation is rife here over the prospects for the passage of the bill introduced under Governor Pinchot's sponsorship which would abolish the present utilities board and in its place establish a new regulating body to be known as the "Fair Rate Board" with broader powers of control over the utilities. One of the provisions of the bill is that earnings of any utility in excess of 7 per cent shall go to the State.

◆

Irwin, Pa.—The Irwin-Herminie Traction Company, supplanted interurban railway service between Irwin and Herminie on March 19 with service by bus.

◆

Chicago, Ill.—Guy A. Richardson, vice-president and general manager of the Chicago Surface Lines and identified with metropolitan transportation management for more than 30 years, was recently elected president of the Union League Club of Chicago, one of Chicago's oldest and largest men's organizations. Mr. Richardson is the 48th president of the Union League Club, which, founded in 1879, for more than half a century has been actively identified with civic and patriotic movements of the Midwest.

◆

Wabash, Ind.—The Indiana Service Corporation has been authorized by the Public Service Commission to substitute service by bus for street car service here for a two-year trial period. At a public hearing last January the company contended that its city cars had been operated at a loss for the past seven years, and that present earnings did not justly replacing the present obsolete equipment with new cars. The street car service will be discontinued about May 1.

◆

Boston, Mass. — The Boston News Bureau says that although the Eastern Massachusetts Street Railway was almost overwhelmed by the difficult conditions of 1930, the property nevertheless earned its interest charges, after depreciation, by a margin of $436,871. Interest charges of $904,733 were therefore earned nearly 1½ times. Before depreciation interest charges were earned 2½ times. Current liabilities amounted to only about $50,000. In other words, there was in the vicinity of $1,922,000 of "net quick," reflecting a ratio of about 39 to 1.

Catering to the Urge to Play Bridge

"Good morning. Won't you join us in a game of bridge?" Passengers of the Pacific Electric Railway are now encouraged to engage in card games through the company's supplying of a card playing board to all who request it. Conductor T. L. Lyons originated the idea. He is shown delightedly watching card "fans."

International Business Meeting

Tariffs, embargoes, cartels, quotas, and war debts are among the subjects to be discussed at the meeting of the International Chamber of Commerce in Washington May 4 to May 7—the first meeting of the International chamber in the United States. A larger attendance than at any previous annual meeting is expected. Representative delegations will be in attendance from the countries which have important commercial relationships with the United States. Every delegate will be encouraged to express his real feelings that a record of the best thought on controversial subjects may be built up in the hope that it may lead to constructive action. A feature of the meeting expected to excite interest is the discussions of the attitude business should take toward various activities of Soviet Russia.

◆

Agitation Over Operation in Springfield Renewed

Action to bar the operation of both passenger and freight cars of the Cincinnati & Lake Erie Railroad from the streets of Springfield was taken on March 16 by the City Commission. This is the newest development in the controversy between the city and the company over the operation of freight trains over the city streets.

The action of March 16 was in the form of two resolutions. One of these declared that the company lacked a franchise to operate its cars over the city streets, and the other instructed and empowered the city solicitor to start proceedings to have the first resolution enforced through the police powers.

Officials of the company declared that the company was under the control and regulation of the Public Utilities Commission, and that the city of Springfield lacked authority to restrict operation.

The company contends that it has the legal right to move freight over its lines in the city; the city contends that the company has no sanction of any kind to do this. Manufacturers who ship over the company lines are supporting it in its stand. The differences have been complicated by the fact that the situation has apparently become embroiled in politics. City Commissioner Miller, an opponent of the company, represents a minority on the City Commission, but his group hopes to obtain control of the commission in the next election. Members of the legal profession hold that the city cannot entirely oust the company from the streets but even they hold to the opinion that the chances of the city are good to secure certain restrictions of operation and to have them sustained if the measures are not too restrictive.

◆

Club Banquet Well Attended

Transportation topics were touched upon from many angles by speakers at the annual banquet of the New England Street Railway Club held at the Copley-Plaza Hotel, Boston, on March 19. The retiring president, N. J. Scott, thanked the members of the club for assistance rendered during the past year and introduced C. B. Pierce, the new president, who bespoke their continued co-operation. After these brief talks by the retiring and incoming presidents, Clarence Hubbard, assistant secretary Aetna Life Insurance Company, as toastmaster, introduced the other speakers.

That electric railway service is vital in urban centers was the opinion expressed by Joseph B. Ely, Governor of Massachusetts. He spoke of his early connection with the electric railway industry as legal advisor for certain companies in the western part of the state. As a firm believer in the essentiality of the service, he expressed keen interest in legislation to preserve the integrity of the railway systems in the state.

The compliments of Mayor James M. Curley were presented by John B. Sculley, who told of the endeavors being made to develop business and industry in the metropolitan area of Greater Boston.

No matter what the type of vehicle used, transportation is a single industry according to Alfred H. Swain, vice-president General Motors Corporation. He emphasized the importance of thinking in terms of transportation, rather than in terms of particular types of vehicle.

Following Mr. Swain, Charles Gordon, managing director American Electric Railway Association, pointed out that the street railways have learned much from the automobile industry. He spoke of the many problems that the two industries have in common, such as relief of traffic congestion, etc.

Preceding the banquet, a business meeting was held at which new officers were elected for the coming year as follows:

President, C. B. Pierce, New Bedford, Mass.; vice-presidents, A. J. Boardman, Boston, Mass., C. H. Chapman, Waterbury, Conn., John B. Crawford, Concord, N. H., Albert E. Haseloff, Burlington, Vt., Edward M. Graham, Bangor, Me., Alonzo R. Williams, Providence, R. I.; secretary, John W. Belling, Boston, Mass.; treasurer, Fred F. Stockwell, Cambridge, Mass.; executive committee, George E. Haggas, H. R. Whitney, E. L. Lockman, H. S. Day, George Acker, L. E. Lynde, H. H. Hanson.

◆

Experiment With Reduced Fares

Fares have been reduced by the Tygarts Valley Traction Company, Grafton, W. Va., from 8 cents to 6½ cents, if books of 20 or 50 trips are purchased. The change went into effect on March 20 and will continue until May 10. If public patronage meanwhile is sufficient in volume, the 6½-cent fare will be made permanent. The cash fare remains at 10 cents, with three tickets or tokens at 25 cents. Books carrying 50 coupons good for the use of school children cost only $1.50. This is in keeping with the price in vogue for school children.

◆

Terminal Work Inspected

The mid-year meeting of the various committees of the rolling stock division of the American Electric Railway Engineering Association was held at the General Electric Lighting Institute at Nela Park, Cleveland, Ohio, March 5 and 6. Approximately 40 railway operating men and railway supply manufacturing representatives attended. The members were entertained at dinner on the evening of March 5 at the Chamber of Commerce by the Edison Lamp Works and National Lamp Works, after which the entire group inspected the Cleveland Union Terminal under the direction of H. W. Pinkerton, electrical engineer of the terminal company. The meetings adjourned at 3 p.m., each day to permit inspection of Nela Park's facilities.

Members of the Group that Inspected the Cleveland Terminal

Seattle's C's.—Co-operation, Courtesy, Carefulness and Cleanliness

Seattle's superintendent of public utilities has announced a schedule of lay-offs without pay or permanent dismissal from service on the municipal railway to be imposed hereafter as penalties for violations of rules and trainmen's neglect of duty toward the public. Also three emergency inspectors with headquarters at North Seattle have been detailed to speed by auto on short notice to any part of the city to clear up trouble and expedite the resumption of interrupted service. Three others are assigned to similar duties in the downtown area, while six more inspectors tour the other sections by street car in a continual effort to improve service.

Under the new penalty system, failure of operators to call streets will be punishable with a no-pay "vacation" ranging from one to ten days. Untidy appearance or improper conduct will impose a lay-off of from 1 to 30 days without pay; collision of street cars, one day lay-off to complete dismissal; visiting with passengers, one day off to complete dismissal; collision with vehicles or pedestrians, one day to dismissal; failure to report accident, from three days to dismissal; failure to make accurate or prompt report of receipts, from 3 to 30 days off, or dismissal. There are many other penalties, but these are typical. Superintendent Avery has also urged trainmen to adopt what is known throughout the department as the "four C's," contained in a circular sent to men and women in all branches of the service of the Seattle Municipal Railway. The C's stands for "Co-operation," "Courtesy," "Carefulness" and "Cleanliness."

◆

Change of Name for Interstate

The name of the Interstate Public Service Company has been changed to Public Service Company of Indiana, to indicate more accurately the scope of the company's business and the extent of the territory it serves.

Simultaneously stockholders were called to meet on April 15 to consider a proposal to reorganize the corporation under the Indiana general corporation act, passed by the Legislature in 1929. Among other things, the plan will provide for the conversion of the present outstanding 7 per cent prior lien stock and preferred stock, on a share for share exchange basis, into prior preferred stock without par value. In the opinion of the directors, the corporation will function with greater facility if it reorganized under this act.

The company is a subsidiary of the Midland United Company. It operates electric railway and motor coach service between Indianapolis and Louisville, Ky., and furnishes electric, gas and water service to a large territory in southern and central Indiana.

Conspectus of Indexes for April, 1931

Compiled for Publication in Electric Railway Journal by

ALBERT S. RICHEY

Electric Railway Engineer, Worcester, Mass.

	Latest	Month Ago	Year Ago	Last Five Years	
				High	Low
Street Railway Fares* 1913 = 4.84	Mar., 1931 **7.80**	Feb. 1931 **7.77**	Mar., 1930 **7.69**	Mar., 1931 **7.80**	Mar , 1926 **7.35**
Electric Railway Materials* 1913 = 100	Mar., 1931 **124**	Feb., 1931 **125**	Mar., 1930 **142**	Dec., 1926 **159**	Mar., 1931 **124**
Electric Railway Wages* 1913 = 100	Mar., 1931 **231.9**	Feb., 1931 **231.9**	Mar., 1930 **231.7**	Jan., 1931 **231.9**	Mar., 1926 **224.1**
Electric Ry. Construction Cost Am. Elec. Ry. Assn. 1913 = 100	Mar., 1931 **187**	Feb., 1931 **189**	Mar., 1930 **203**	Nov. 1928 **206**	Mar., 1931 **187**
General Construction Cost Eng'g News-Record 1913 = 100	Mar., 1931 **194.5**	Feb., 1931 **196.6**	Mar., 1930 **206.8**	Jan., 1927 **211.5**	Jan., 1931 **194.5**
Wholesale Commodities U. S. Bur. Lab. Stat. 1926 = 100	Feb., 1931 **75.5**	Jan., 1931 **77.0**	Feb., 1930 **92.1**	Feb., 1926 **102.1**	Feb., 1931 **75.5**
Wholesale Commodities Bradstreet 1913 = 9.21	Mar., 1931 **9.17**	Feb., 1931 **9.31**	Mar., 1930 **11.22**	Jan., 1928 **13.57**	Mar., 1931 **9.17**
Retail Food U. S. Bur. Labor Stat. 1913 = 100	Feb., 1931 **127.0**	Jan., 1931 **132.8**	Feb., 1930 **153.0**	April, 1926 **162.4**	Feb., 1931 **127.0**
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	Jan., 1931 **91.0**	Dec., 1930 **92.5**	Jan., 1930 **100.5**	Jan., 1926 **106.8**	Jan., 1931 **91.0**
General Business The Business Week Normal = 100	Mar. 7, 1931 **79.0**	Feb. 7, 1931 **77.5**	Mar. 8, 1930 **94.4**	Oct. 6, 1928 **117.6**	Jan.31, 1931 **77.0**
Industrial Activity Elec. World, kw.-hr. used 1923-25 = 100	Feb., 1931 **110.3**	Jan., 1931 **97.6**	Feb., 1930 **123.5**	Feb., 1929 **140.4**	Jan., 1931 **97.6**
Bank Clearings Outside N. Y. City 1926 = 100	Feb., 1931 **69.8**	Jan., 1931 **74.5**	Feb., 1930 **96.5**	Oct., 1929 **111.8**	Feb., 1931 **69.8**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 121 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Threat of Competition at Portland

The City Council of Portland, Ore., has ordered a franchise advertised for the operation of a bus line on Division Street. W. H. Lines, vice-president the Pacific Northwest Public Service Company, pointed out that 95 per cent of the business of a bus line on Division Street would be business taken away from present routes of his company. Mr. Lines also stated that adequate service would require that $150,000 be spent for buses with no compensating return. The franchise of the Pacific Northwest Company expires next year and if an acceptable franchise is secured from the city the company will work out a plan of service acceptable to the property owners on Division Street. The Multnomah Transit Company, a small independent company now serving West Portland, proposes to render fifteen-minute bus service in the district.

◆

New Deal Impends at Augusta

Evidence that the transportation problem at Augusta, Ga., will be solved to the satisfaction of both the city and the company was furnished at a meeting of the public utilities committee of the Council at which F. B. Culley, manager of the Georgia Power Company's local division appeared. It is understood that the company has agreed gradually to rebuild the railway system, replace old cars by ones recently replaced in Atlanta and repair and repaint equipment now in Augusta that still is considered to be serviceable. The first step, it is said, will be the removal of poles from the middle of the streets along lower Walton Way. Here the street is paved between the car tracks. In turn the committee will recommend to Council that the company be permitted to speed up its cars, that passes be not issued to city employees other than policemen and firemen in uniform, and that the east boundry line be discontinued. The committee will also recommend that the company be allowed to discontinue the hauling of freight to the Lenwood Hospital. The Council is apparently opposed to any plan that contemplates the use at this time of buses or trolley buses as substitutes for rail service.

◆

Another New York Bus Hearing

Another step toward the attainment of bus operation under franchise in New York City was taken on March 24 when the committee of the whole of the Board of Estimate voted in favor of a hearing on April 17 on the petitions of nine companies for franchises. The recommendations for hearings for the nine companies by the committee were made on the basis of recommendations of the Board of Transportation, previously presented to the committee.

At the same time, assistant counsel for the Board of Transportation, in the absence of Chairman Delaney, presented a proposed form of general franchise for bus operation. This form provides for a ten-year, non-renewable franchise with operation under a 5-cent fare and 2-cent transfer. This general form can be changed to meet the needs of any specific route, but if adopted, will serve as a basis for all franchises. The matter was laid over for two weeks for consideration by members of the committee and others interested.

Minister Morrison's London Traffic Co-ordination Bill

The text of the London passenger transport bill, now being piloted through Parliament by Herbert Morrison, British Transport Minister, has just been published. It is a long and complicated document, consisting of no fewer than 68 clauses and nine schedules. As it is of a compound nature, affecting private as well as public interests, after the second reading in the House of Commons it will have to be sent to a select committee—probably to a joint committee of both Houses, to save time and expense—where the interested parties can appear and be represented by counsel. The bill will then come back to the House of Commons and go through normal public bill procedure. The Government hopes to get the second and vital reading shortly.

This bill provides for the appointment of a new transport board—the London Passenger Transport Board—and the complete co-ordination of all the city's transport services. The board will be composed of five members, including the chairman, to be appointed by the Transport Minister after consulting the Treasury.

To secure the provision of an adequate and properly co-ordinated system of passenger transport for the London Traffic Area the bill provides for the taking over by the board of the existing subways and also the Metropolitan District Railway and the Metropolitan Railway, together with the interests of any of these undertakings in any railways owned jointly with the four main-line groups operating throughout the United Kingdom. The suburban lines of the main-line groups will not be taken over, but special arrangements are proposed with a view to promoting co-ordination of the suburban services of these companies with those of the board. The board will also take over all the street car services in the London area as well as the London General Omnibus Company and the London bus businesses of other carriers in the Metropolitan Police District. In the center of London, notably along the Thames Embankment, where the traffic is constantly heavy, it is recognized that street cars still do exceedingly useful work.

It is proposed to acquire the various undertakings of the Underground combine by means of an exchange of stocks. The consideration for other privately owned bus businesses can be discharged either by issues of stock or payments of cash to the proprietors.

The fares to be charged will be subject to revision by the Railway Rates Tribunal on the application of local authorities in the London Traffic Area, and for this purpose additional representatives experienced in London civic government and finance will be added to the Tribunal. Machinery is provided for ensuring close contact between the Board and the London Home Counties traffic advisory committee, the composition of which is modified and made permanent.

Capital in the sum of $650,000,000 is involved in the undertakings which it is proposed to transfer to the board. This body will issue its own stock in exchange for existing privately owned stock, after values have been determined by arbitration. There will be no subsidy from public funds. The board will be able to borrow, but it will be its first duty so to manage its business as to be able to meet all liabilities including the interest on its stocks, and, as a further means of safeguarding its credit, it will be required to accumulate a substantial reserve. The view of the Government is that the board must be able to pay its way as a business undertaking and that there can be no question of a subsidy from public funds.

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Swedish Electrification Progressing

Further electrification of the Swedish state railroad system in the near future is probable. The government has submitted to the Riksdag a proposal for the electrification of the Stockholm-Malmö-Trälleborg section which, with certain branch lines, totals 960 km. (595 miles). It is estimated that the electrification will cost 71,840,000 kronor ($19,253,000). However, an expenditure of 16,400,000 kronor ($4,400,000) will have to be made if steam service is continued, on account of the large increase in traffic. The plans prepared by the Ministry of Communications include the technical details and a financial program for the work. It is pointed out that electrification will gradually reduce the dependence of the Swedish railways on supplies of fuel from abroad, and that there will be large operating savings.

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G. J. Shave Relieved of L.G.O. Operating Duties

At the request of George J. Shave, the directors of the London General Omnibus Company, London, Eng., have relieved him of the operating part of his duties. Mr. Shave was made operating manager at the end of 1918, in addition to his duties as chief engineer, and this dual position, although originally intended as a temporary measure, has been carried on ever since. Lt.-Col. A. W. C. Richardson, D.S.O., is the new operating manager. Until a few months ago he was head of the mechanical warfare experimental establishment at Farnborough. Since the end of last summer he was in command of the fourth Battery Royal Tank Corps.

A Scientific Business

Traffic signals unscientifically employed are quite capable of being worse than useless. Unintelligent experiments, by their lack of success, lead the public to conclude erroneously that the whole idea is intrinsically unsound. Personally, I should like very much to see the effect that would be produced on the traffic of one of our big industrial towns by calling in some expert like Leslie Sorensen, the traffic engineer of Chicago, and swallowing his advice whole and without reservation. In America, traffic control is definitely regarded as a science. If we were to get down to this problem thoroughly, the costs of transport of every commodity carried by road would be materially reduced with incalcuable benefit to the whole community.—Horace Wyatt *in Motor Transport, London.*

BOOK REVIEWS

Autobiography of an Engineer

The Life of W. L. R. Emmet. Published by Fort Orange Press, Albany, N. Y.; 213 pages. Price, $2.

Mr. Emmet's book comprises ten chapters, each dealing with a phase of his full and fruitful life. First come the environment and experiences of the child and the growing boy, an odd boy who found it difficult to learn things according to conventional methods, but had much native ability. Then, in chronological order, follow descriptions leading up to and covering the man's engineering achievements.

His work has covered a wide range. For many years he has carried heavy responsibilities in the electrical and mechanical industries. During his 45 years of activity Mr. Emmet has had a leading part in at least four important phases of electrical development. The first embraced contributions to many types of apparatus and methods of distribution which have been extensively used for many years in the central station industry. The second covered steam turbine-electric apparatus. The third related to the electrical propulsion of ships. The fourth—a most difficult task—has been the invention, design and development of the mercury vapor power system.

"Autobiography of an Engineer" quite fittingly opens with an account of the Emmet family which is historically as well as personally interesting.

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Semaphore and Light Signals

American Railway Signaling Principles and Practices. Chapter XII—Semaphore Signals, and Chapter XIII—Light Signals. Published by the Signal Section, American Railway Association, 30 Vesey Street, New York, N. Y.

These two pamphlets are issued as chapters in the textbook, "Principles and Practices of Railway Signaling," issued by the association. For a number of years the signal section has been engaged in this work and has collected the best information available on the subjects covered.

The chapter on Semaphore Signals is a 72-page pamphlet, with an appendix giving questions on the matter included in the preceding pages. A very complete detailed description of the various types of semaphore signals is given. Illustrations are included showing the parts, and the accompanying text describes the method of operation of each part. Following the descriptive matter, methods of making shop and signal field tests are outlined.

The chapter on "Light Signals" contains 38 pages of similar information covering color light and position light signals. It includes a discussion on electric lamps and their characteristics for signal use. Instructions for maintenance and questions on the subject matter also are included.

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German Street Railway Calendar

"Deutscher Reichsbahn-Kalender 1931." Edited by Dr. Hans Baumann. 160 pages, illustrated. Published by the German State Railways, Berlin W 8, Germany. 4 reichsmarks.

For the year 1931 the German State Railways is issuing its annual calender in its usual attractive form. Each page gives an item of information about the system, together with a halftone reproduction of a scene along the road. The connections between Germany and foreign countries and the terminal stations at such points are featured this year.

PERSONAL MENTION

St. Louis Companies Move for Closer Co-ordination

Col. Albert T. Perkins, who has been elected president and general manager of the People's Motor Bus Company, St. Louis, Mo., to succeed Richard W. Meade, served as general manager for Receiver Rolla Wells, of the United Railways, St. Louis, previous to 1927.

Col. Perkins is also vice-president of the City Utilities Company, a holding company which controls the People's Motor Bus Company and also has virtual control of the St. Louis Public Service Company through ownership of stock.

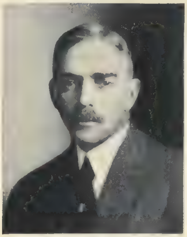
One of the matters that will receive Col. Perkins' early attention is the still closer co-ordination of the buses of the People's Company with the street cars of the St. Louis Public Service Company. The need for such co-ordination has long been recognized by the railway management and its consummation recommended by the St. Louis Transportation Survey Commission as a means of improving the city's transportation.

It was in 1919 shortly after his return from France, where he had been director of combat railways for the American Expeditionary Forces, that Colonel Perkins assumed the duties of manager for the receiver of the United Railways, predecessor to the St. Louis Public Service Company. He succeeded Richard McCulloch in that post.

Previous to that he had been railway advisor for the St. Louis Union Trust Company, in which capacity he had charge of the trust company's interest in the St. Louis, Brownsville & Mexico Railway. He was also consulting engineer in the construction of the lines of the Southern Traction Company of Texas.

Col. A. T. Perkins

Colonel Perkins was born in Brunswick, Me. He was graduated from the Boston Latin School and from Harvard University. He began his railway career with the Chicago, Burlington & Quincy Railroad in 1887, and continued with that company in various capacities until 1907 when he was called to St. Louis as advisor to the Municipal Bridge & Terminal Commission when Rolla Wells, later the receiver of the United Railways, was Mayor of St. Louis. He served with the commission until 1909, his duties requiring him to investigate the terminal facilities of the principal American and European cities. In 1908, while still acting as advisor to the commission, he was made railroad advisor and syndicate manager for the St. Louis Union Trust Company.



R. W. Meade

Mr. Meade plans to open an office in St. Louis as an expert and consultant on motor vehicle transportation. He was connected with the operating departments of steam and electric railways until 1904. From 1904 to 1918 he was president and general manager of the New York Transportation and the Fifth Avenue Coach Companies. Under his direction the first taxicab and motor bus systems in the United States were organized and developed, and under his supervision these companies were converted from a virtual bankrupt condition to one of great public benefit and corporate profit. His next important work was for the Detroit Motor Bus Company as president and general manager from 1919 to 1921. This company he organized and developed into one of the first successful systems of its kind. From 1921 to 1923 he engaged in consulting work from coast to coast. Since 1923 he has been president and general manager of the Peoples Motor Bus Company, St. Louis. He helped to organize that company and has been mainly responsible for its intensive development. Into this company the street railway interests bought—bringing about a natural affiliation of interests through the City Utilities Company as the vehicle dominant through stock ownership in both forms of public service—motor bus and trolley car.

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A. S. Widenor Retires From Omaha Company

After serving the Omaha & Council Bluffs Street Railway, Omaha, Neb., for the past 43 years, A. S. Widenor, treasurer, has retired from the service. Mr. Widenor went to work for a predecessor of the present company on June 11, 1888. In 1889 he was made assistant superintendent of the company. In 1890 he went to the treasurer's department where in 1902 he was made cashier, and in 1914 was appointed treasurer, in which capacity he has served ever since.

J. P. Barnes to Visit Europe

James P. Barnes, former president of the Louisville Railway, Louisville, Ky., expects to sail for France on April 3, from New York, with Mrs. Barnes, on the *Westernland*, to meet their son, James M. Barnes in Paris. Miss Mary Ann Barnes, student at Syracuse University, will join them in Paris in June. Mr. Barnes plans to spend several months in Europe accompanied by his family.

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Accountants Are Headed by Aurora-Elgin Road Auditor

L. J. Wertzler, auditor of the Chicago, Aurora & Elgin Railroad, Aurora, Ill., was elected president of the Central Electric Railway Accountants' Association for the year 1931 at the meeting of that body at South Bend, Ind., on Feb. 27. This was in line with his previous association activities, for in 1923 Mr. Wertzler was appointed representative of the North Shore Line in the Central Electric Railway Accountants' Association, serving on the executive committee as well as various other committees and as second vice-president of the organization.

After experience in salesmanship and in commercial accounting, Mr. Wertzler entered the utility field as chief clerk of the passenger accounting division of the Chicago, North Shore & Milwaukee Railroad at Highwood, Ill., on Sept. 16, 1918. Later he was promoted to assistant auditor of passenger accounts and then to auditor of passenger accounts. On March 15, 1929, he was transferred to the general office of the company at Chicago to the position of special accountant to the comptroller of the North Shore Line and the Metropolitan Motor Coach Company. On May 15, 1930, he was appointed auditor of the Chicago, Aurora & Elgin Railroad with offices at Aurora.

L. J. Wertzler

During his connection with the North Shore Line, Mr. Wertzler served one term as secretary of the A.E.R.A. Company Section and also served several terms as treasurer and trustee of the Employees Mutual Benefit Association as well as taking active part in first-aid work, safety promotion and public speaking.

Mr. Wertzler was born in Chicago in 1894 and was educated in the public schools of that city.

H. B. Sawyer Retires as Stone & Webster Officer

Henry B. Sawyer is severing his active connections with Stone & Webster, Inc., effective on April 30, in fulfillment of a promise made some 25 years ago to his wife that he would retire from business when he reached the age of 60.

It is 41 years since Mr. Sawyer became connected with Stone & Webster. In point of service he is one of the oldest men in the organization, for he went into the office within a few months of its opening.

From the start he gave attention to financial matters, establishing the credit of Stone & Webster, and of the companies under its executive management, and seeing to it that funds were available at all times for the proper conduct of the business. Being very close to Mr. Stone and Mr. Webster he has reflected the policies of the heads of the organization.

Mr. Sawyer was admitted to the firm on Jan. 1, 1920, and at the time of its incorporation became vice-president and assistant treasurer of Stone & Webster, Inc. He has also been treasurer of the operating companies practically all the time they have been under the executive management of Stone & Webster.

Upon his retirement he is planning with Mrs. Sawyer and their daughter, Elizabeth W., a six-month tour of Europe, and after his return he will devote himself to leisure and to the pursuit of the charitable and other activities in which he is interested. He remains a member of the board of directors of Stone & Webster, Inc.

E. A. Keenan With Ohio Interurban

Edward A. Keenan, formerly with the Philadelphia Rapid Transit Company, Philadelphia, Pa., has joined the Cincinnati & Lake Erie Railroad at Dayton, Ohio, to handle publicity and advertising. Edward Keenan has had wide and varied experience as a journalist and in advertising and publicity work. In the fall of 1925 he joined the forces of the railway in Philadelphia to take charge of newspaper publicity work in the public relations department of the company there. In that post his duties covered a vast range of activities, among his notable achievements being the campaigns in which he participated advertising and promoting the company's special services. Before he entered the P.R.T. service he had been assistant editor of the *Automotive Trade Journal*. Mr. Keenan is a Lehigh University man. He also engaged in newspaper work for the *Herald* in Newcastle, Pa., and the *Record* in Greensburg, Pa.

His Men Remember H. W. Noyes

A birthday cake displayed recently in the window of a candy shop in Berlin, N. H., attracted attention. The cake was a replica of an electric car and was presented to Harry W. Noyes, manager of the Berlin Street Railway, as a birthday gift from the employees. It was made by Mrs. Lydia Drouin. The entire cake, including the body, pole, trolley rope, headlights, windows and steps were all made of cake dough beautifully iced and inscribed. Mr. Noyes was celebrating the anniversary of his birthday at his home with family and relatives when a delegation from the company delivered the cake.

C. A. Newton in New Post at St. Louis

Cleveland A. Newton has been selected to serve as counsel for the special transportation committee of the St. Louis, Mo., Board of Aldermen. Some months ago Mr. Newton served as special counsel for a committee of aldermen then considering plans to put the railroad deck of the Municipal Bridge to work, and it was largely due to his efforts that an agreement was reached with the Terminal Railroad Association to use the municipal bridge and open the upper deck of the Eads Bridge as free public highway for pedestrians and non-commercial vehicles.

The special aldermanic committee recently decided to endeavor permanently to solve the city's transportation problems rather than merely to confine its activities to making a report. For its guidance the committee has the recent report of the transportation survey commission and the recommendations of R. F. Kelker, Jr., Chicago, Ill., who served as expert for that commission.

Mr. Newton represented the Tenth Missouri District in Congress for many years. More recently he has been general counsel of the Mississippi Valley Association.

F. J. Gannon, El Paso, Promoted to Manager Tampa Utilities

F. J. Gannon

Francis J. Gannon, president of the El Paso Electric Company, El Paso, Tex., has been promoted to the Tampa Electric Company, and will assume the active management of an important group of properties in Florida, with headquarters in Tampa. The Tampa Electric Company is operated under the executive management of the Stone & Webster Service Corporation and does the entire electric light, power, street railway and bus business in Tampa, in addition to the electric light and power, water and ice business in a number of smaller cities.

Mr. Gannon made a splendid record as head of El Paso Electric Company during his service there, starting in November, 1928, as manager and later as president of the company. For 1928 El Paso Electric Company received the Charles A. Coffin Award, the highest honor within the gift of the electrical industry. Under Mr. Gannon's administration, the company likewise made notable progress in improved safety in operation. The company received honorable mention and a certificate of award, for outstanding safety records in 1927 and 1928. This award is provided by the Anthony N. Brady Memorial under the direction of the American Electric Railway Association. Moreover, the company established an outstanding record in sales work during the years 1929-30. In addition to winning the cup for the best record in the sale of electric refrigerators of some 1,525 dealers in the Southern area, the company at El Paso made an outstanding sales record for the twelve months ended June 30, 1930. For the latter achievement the sales department won the first annual sales contest, conducted among all allied companies operating under executive management of the Stone & Webster Service Corporation.

Notable progress also was made under Mr. Gannon's direction in the matter of improvements to the physical property. The new Rio Grande power station was completed in 1929, together with power lines, substations and equipment necessary, which practically doubled the company's generating capacity. A new transmission line to serve Las Cruces and the upper valley was completed during 1929.

Prior to joining the company at El Paso, Mr. Gannon had long experience that admirably fitted him for the highly responsible duties of his job. Beginning in the general offices of Stone & Webster, after completing school, Mr. Gannon has continued with that organization for 29 years, advancing to various positions of increasing responsibility.

Mr. Gannon went to El Paso from Florida, where he was vice-president of the company which established a fine record in constructing Davis Islands in Tampa Bay. Prior to that time he was assistant treasurer of electric light and power, street railway and other utility companies, under Stone & Webster executive management at Dallas, Pawtucket, Brockton and Reno. From 1916 to 1926 Mr. Gannon held a similar position with the Northern Texas Traction Company, Fort Worth.

In spite of the many company problems that engaged his attention during his service with the utility at El Paso, Mr. Gannon took an active part in civic betterment work. As a director of El Paso Chamber of Commerce and chairman of its new industries committee, he has been particularly active in affairs of that body. He was recently elected second vice-president of that body as a token of appreciation of his work. In the Community Chest Drive. Mr. Gannon was one of those responsible for the plan by which gifts sought in the last chest drive were worked out upon the basis of individual earnings, with the result that the drive recorded the greatest amount ever subscribed to the chest in El Paso.

Northern Indiana Operated Separately

In the personal in Electric Railway Journal for March, page 165, in which the career of George R. Green was reviewed in connection with his election to head the Central Electric Railway Association it was inadvertently stated that the Northern Indiana Railway, Inc., South Bend, of which Mr. Green is vice-president and general manager, is operated under Insull auspices. This was an error. The Northern Indiana Railway, Inc., is an entirely separate organization, operated independently of other affiliations.

Personnel of New Chicago Company Announced

Charles F. Clarke, vice-president of Halsey, Stuart & Company, has been elected president of the Chicago Local Transportation Company, organized last year to take over the surface and elevated lines.

This became known on March 24 as Halsey, Stuart & Company, reorganization managers, prepared to declare operative the financial plan for merging the elevated and surface lines.

According to E. C. Norlander, writing in the *Daily News,* Mr. Clarke will serve as head of the company until it becomes a going concern and begins the actual operation of the unified system. When this has been accomplished it is understood that Mr. Clarke desires to return to the bond brokerage business.

At the same time that Mr. Clarke was elected president, E. T. Cunningham, also of Halsey, Stuart & Company, was named vice-president of the new company, and Phelps Kelley, likewise of the bond house, was chosen secretary and treasurer. While nothing definite was announced, it is believed that these two also will serve only until the company has been placed upon an operating basis, when officers of the present local transportation companies will take over the reins.

The new president was born in Chicago 37 years ago. He is a graduate of Cornell and during the war served as a lieutenant in the 2d engineers of the 2d division. He has been associated with Halsey, Stuart & Company since 1917, having left the company during his service in the army.

T. E. Wood 43 Years at Omaha

Thomas E. Wood, master mechanic of the Omaha & Council Bluffs Street Railway, Omaha, Neb., since 1903, after a three-month furlough, will be retired on a pension when he reaches the required age of 70 on June 11. In announcing the retirement of Mr. Wood, C. D. Porter, vice-president and general manager of the company, said that he had been a loyal, faithful and efficient worker and had helped the street railway art by his contributions, particularly to car design.

Mr. Wood entered street railway work at Omaha in November, 1888. Two years later he was made general foreman for the Omaha Cable & Tramway Company, and while acting in this capacity he supervised the conversion of horse cars into car trailers, and changed cable cars into electrics. During the time Mr. Wood was master mechanic of the tram company, he supervised the construction of 173 passenger cars and a number of work cars, rated among the best in the United States.

D. S. James Promoted by Penn-Ohio

Donald S. James, recently appointed general traffic superintendent of all the transportation companies which formerly were part of the Northern Ohio Power & Light Company, and also of the transportation units of the Penn-Ohio System, is well known throughout that system.

Mr. James assumed his new position after eleven years of training in various departments of the transportation business. Upon his graduation from high school in 1919 he entered the service of the Penn-Ohio system at Youngstown as an assistant in the treasury department. From 1920 to 1923 he attended Ohio State University, working for the Penn-Ohio during summer vacations and for the Columbus Railway, Power & Light Company while attending college.

D. S. James

On March 1, 1924, he was appointed traffic investigator for the Penn-Ohio and in 1926 was promoted to the position of general passenger agent. He remained in this capacity until his recent promotion.

The territory served by the various lines under Mr. James' supervision covers a large area. The interurban coach system alone provides transportation service to more than 100 cities and villages in Ohio and Pennsylvania, and covers more than 700 miles of certificated routings. Mr. James and his assistants have entire supervision of all terminals, schedules, excursions, chartered service, arranging of tariffs, ticket disbursements, etc.

C. A. McCulloch Active Again

Charles A. McCulloch, former president of the Parmelee Transfer Company, Chicago, has returned to active business through his election as chairman of the board and treasurer of the John R. Thompson Company. Mr. McCulloch will be actively identified with the management of the company. For many years he has been a leader of business and finance in the Middle West. He is at present identified with the Omnibus Corporation, Chicago Motor Coach Company, Fifth Avenue Bus Company, New York, Fifth Avenue Securities Company, Lawrence Stern Company and is a director of the Foreman State National Bank and the Chicago Cubs.

L. W. Tuttle Heads Brooklyn Signal Division

L. W. Tuttle has been named superintendent of the signal division of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., to fill the vacancy caused by the death of John J. Larkin. He qualified himself for advancement through the ranks by study and attendance at technical courses that would aid him in solving practical problems that confronted him in connection with his everyday work.

Mr. Tuttle started with the Brooklyn transit system in the signal division as soon as he left school. After completing his high school course he successfully completed one of the electrical courses at Pratt Institute, Brooklyn. From Pratt Institute he went to the Brooklyn Rapid Transit System on June 29, 1914, as a lampman in the signal division. Within three years he had advanced to the rank of assistant foreman. From June, 1917, until June, 1919, he was in military service during the World War and on his discharge returned to the signal division. On July 25, 1919, he was appointed assistant supervisor of maintainers and on May 14, 1920, promoted to the post of supervisor of maintainers. He also studied in the evening course in electrical engineering at Polytechnic Institute.

Harry Sharpless With Gulf Refining

After seventeen years of service with various Stone & Webster properties, and almost seven years with Gulf States Utilities Company, Beaumont, as superintendent of production, Harry Sharpless has joined the Gulf Refining Company in Port Arthur, Tex., as superintendent of power. Mr. Sharpless joined Stone & Webster in 1913 as student engineer at Tampa. In successive steps he was assistant chief engineer of the Blackstone Valley Gas & Electric Company in Rhode Island, chief engineer of the Baton Rouge Electric Company, and chief engineer of the Pensacola Electric Company, from which job he went to Port Arthur as superintendent of power plants in June, 1924.

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Edwin S. Webster, Jr., has resigned as vice-president of Stone & Webster, Inc., and as president of its subsidiary, the Stone & Webster Investment Corporation. This will leave him free to devote his main attention to the affairs of Kidder, Peabody & Company, bankers, of which he has became a partner.

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R. E. Jamieson has been made general passenger agent of the Chicago, South Shore & South Bend Railroad with offices at 72 West Adams Street, Chicago. Mr. Jamieson was formerly district passenger agent of the South Shore line.

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Lawrence Antista has been made assistant trainmaster, Southern Division, Pacific Electric Railway, Los Angeles, Cal. Previously a supervisor, Mr. Antista fills the post formerly occupied by and vacated through the death of A. C. Vignes. Coming into the employ of the company in September, 1918, as a conductor, Mr. Antista in addition to his platform experience, served as switch foreman, dispatcher and supervisor.

R. R. Strehlau in Penn-Ohio System Purchasing Post

Appointment of R. R. Strehlau as purchasing agent for all transportation companies in the Akron District, which formerly were a part of the Northern Ohio Power & Light Company, has been announced by Vice-President and General Manager P. V. C. See.

Mr. Strehlau has served continuously in various phases of the transportation business for 38 years. In 1893 he entered the service of the Wheeling & Lake Erie Railroad as a car repairman and later was promoted to storekeeper. He remained in this position until 1900, when he became storekeeper for the Lake Shore Electric Railway. His rise with this company was rapid. He was appointed purchasing agent and a short time later was placed in charge of the Western division as superintendent of transportation.

R. R. Strehlau

In 1917 Mr. Strehlau accepted a position as freight loss and damage investigator for the Big Four Railroad, with headquarters at Indianapolis. His next connection, in 1920, was with the Northern Ohio Power & Light Company as general transportation storekeeper. In 1924, Mr. Strehlau accepted a position as assistant to the vice-president and general manager of the Lake Shore Electric Railway. He remained in that post until 1926, when he again joined the Northern Ohio Power & Light Company as general transportation storekeeper, where he continued to serve until his recent promotion.

As *Transportation News,* the company publication, said, Mr. Strehlau's many years' experience in the railway business and his knowledge of transportation equipment and necessary stocks and supplies, place Mr. Strehlau in a most favorable position to serve efficiently the transportation companies in the Akron district.

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Samuel Insull, Edison Pioneer, Honored

The 50th anniversary of Samuel Insull's arrival in America—Feb. 28, 1931—was made the occasion of a testimonial dinner to him at the Palmer House in Chicago by the executives of the utility organizations which operate under his leadership. Nearly 700 were present, some of whom came from points as widely separated as London and San Francisco, Texas and Canada.

John F. Gilchrist, vice-president of the Commonwealth Edison Company, in Chicago, as the oldest "Edison" man in point of service with an Edison organization in Chicago, acted as master of ceremonies. At the speakers' table were 33 directors of Insull companies, not including any directors who also are officers.

The setting of the Grand Ballroom of the Palmer House was adapted to the spirit of the occasion. Twenty-eight tables carried lighted models of maps of states in which the Insull companies provide some form of utility service or maintain offices. Two large American flags were mounted at the speakers' table. At two other tables a British and Canadian flag symbolized operations in these countries.

At 9 o'clock Thomas A. Edison, speaking from Fort Myers, Fla., greeted the assembly and congratulated the guest of honor, who was Mr. Edison's secretary and personal representative for more than a decade.

Mr. Insull's speech dealt with incidents of his work in America. As a permanent reminder of the event, Mr. Insull was presented a beautifully executed scroll on which were engrossed the names of his associates who attended the dinner.

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Messrs. Shannahan and Hanna Are U. S. Chamber Candidates

Announcement has been made of the candidacies of J. N. Shannahan, president of the Omaha & Council Bluffs Street Railway, as a director of the Chamber of Commerce of the United States in the transportation and communication department, and of J. H. Hanna, president of the Capital Traction Company and president of the American Electric Railway Association, as a director representing the third district. Mr. Shannahan is running for election to succeed A. W. Robertson, of the Westinghouse Electric & Manufacturing Company, whose term expires this year at the annual meeting of the Chamber April 28 to May 1 at Atlantic City. Mr. Robertson is not a candidate for re-election.

As a representative business organization, the Chamber is giving serious consideration to national transportation problems of vital interest to the country. The election of Mr. Shannahan and Mr. Hanna as directors would bring to that body their broad experience and fundamental knowledge of transportation matters. Both have long been actively interested in and identified with the work of the Chamber, having served as national councilors from the American Electric Railway Association. One director in each department of the Chamber is elected each year. In addition one director is elected from each geographic division into which the Chamber's directorate is divided.

Running as a department candidate, Mr. Shannahan is therefore not in competition with any other candidates except those proposed for the transportation and communication department. His candidacy has been widely endorsed.

Mr. Hanna's candidacy is endorsed and his campaign is being conducted by the Washington Board of Trade, the Washington Chamber of Commerce, the District of Columbia Bankers' Association, the Merchants' and Manufacturers' Association and the Chamber of Commerce of Alexandria, Va.

J. D. Dewees Continues With Ohio River Road

J. D. Dewees, who supervised the building of the Youngstown & Ohio River Railroad, Leetonia, Ohio, and was its president for several years, will continue as head of the road under the new managership. The line was recently purchased at foreclosure by Briggs & Turivas, Chicago.

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C. B. Pierce Named to Head New England Club

Clifton B. Pierce, superintendent of transportation of the Union Street Railway, New Bedford, Mass., was elected president of the New England Street Railway Club at the annual meeting held in Boston, Mass., on March 19. Mr. Pierce has been an active member of the club for the last twenty years. He served previously as vice-president of the club from Massachusetts, and during his membership he has also served on the various important committees of the club.

C. B. Pierce

Perhaps no member of the New England Street Railway Club is better known to the club membership than Mr. Pierce. This despite the fact that he is of retiring disposition. In accepting the presidency he made no predictions for the future, but those who know the man realize that its affairs will be supervised with the modest dignity of mein which has characterized all his other work, but a purposeful dignity that has militated so much to his success with the New Bedford Company. Incidentally, that term of service has covered more than a quarter of a century. And it can truly be said that Mr. Pierce's principal hobby is the operation of the Union Company's trolleys, buses and taxicabs. As superintendent of transportation he comes in daily contact with the public and employees, and in each case he is held in high esteem.

Clifton Bradford Pierce was born in New Bedford, Mass., on April 12, 1878. After attending the public schools there he entered the employ of a company selling supplies to the textile mills of the city. On June 27, 1901, he went to work for the Union Street Railway as motorman. In less than a year he was promoted to the post of night foreman at the Weld Street carhouse. On May 25, 1909, he was appointed assistant superintendent of transportation, a position in which he continued until he assumed his present position as superintendent of transportation.

Edward J. Noonan has resigned as a member of the board of advisory subway engineers in Chicago, it has been announced by Alderman Bowler, chairman of the City Council committee on local transportation. Mr. Noonan was already employed as engineer for the railways terminal committee of the council. Alderman Bowler believes that it is inadvisable for a city employee to draw two salaries. For that reason Mr. Noonan's resignation was accepted.

◆

Clell Etter has been appointed traffic representative for the Indiana Railroad and co-ordinated lines at Anderson, Ind., succeeding Ross Luellen, who recently resigned to become general manager of the Saginaw Transit Company, Saginaw, Mich. Mr. Etter is a veteran employee of the Indiana Service Corporation. He served as steward of that company's dining car service and in charge of the commissary department at Fort Wayne from 1918 until the service was discontinued late in 1930.

Charles P. Kahler, electrical engineer for the Union Pacific system, with headquarters at Salt Lake City, has been transferred to the company's Omaha headquarters. Mr. Kahler has been with the railroad for 25 years. He is Western director of the Association of Electrical Railway Engineers, and is a member of the American Institute of Electrical Engineers and of the American Society of Civil Engineers.

◆

S. R. Inch, vice-president, has been elected executive vice-president of Electric Bond & Share Company, New York. Frank A. Reid, general attorney, has been elected a vice-president. Mr. Inch is serving as an officer, principally in the post of vice-president, of many of the utility companies included in the Electric Bond & Share group, notably the American Power & Light Company, Electric Power & Light Corporation, National Power & Light Company, Utah Light & Traction Company and Utah Power & Light Company.

OBITUARY

Julius L. Adams

Julius L. Adams, president and general manager of the Philadelphia & Western Railway, died Sunday morning March 1 at his home in Norristown, of a heart attack. Although ill for some time, Mr. Adams was at his office daily. He arose Sunday morning and after eating breakfast returned to his room where he expired suddenly with Mrs. Adams ministering to him.

Mr. Adams was a man of commanding presence and engaging personality. A strict disciplinarian, he won and enjoyed to a very unusual degree the respect and personal regard of those subject to his authority. He was a man of integrity and high ideals and a host of friends in many communities will greatly miss his genial companionship.

Mr. Adams went to Norristown in 1912 when the Philadelphia & Western road was extended to Norristown after completion of the Villanova-Stratford line. His first position with the company was as general manager succeeding E. C. Spring, but for the last six years he has been its president, succeeding Thomas E. Newhall. When he joined the Philadelphia & Western, Mr. Adams had long been engaged in railroad work in various capacities. In all these positions of increasing responsibility he gained experience which enabled him to render valuable service in building and operating the Philadelphia & Western Railway, which has been an important factor in developing the northwestern suburbs of Philadelphia.

Julius L. Adams was born March 14, 1866, in Brooklyn, N. Y. His father, Capt. Julius W. Adams, of the Regular U. S. Army died before Mr. Adams' birth, from wounds received during the Civil War. Mr. Adams was reared by his grandfather Col. Julius Walker Adams, at his home in Brooklyn.

From boyhood his tastes followed family tradition and he turned to a career of railroad construction. As a young engineer he spent several years in construction work on the Denver & Rio Grande Western, in Colorado, and also on the Panama Railroad. Returning east he engaged in construction work on electric railways in his native city and in Yonkers, N. Y. Shortly after his marriage to Georgiana Heermance, of Yonkers, N. Y., he became manager of an interurban road in Connecticut. He went thence to Columbus, Ohio, and later to Norfolk, Va.

Mr. Adams was active in civic affairs and widely known as a fraternalist. He was a member of the Art Club of Philadelphia; Norristown Club, a member of Norristown Rotary Club for twenty years, Norristown Chamber of Commerce, Bankers Country Club, American Electric Railway Association and a member of Squadron "A," National Guard of New York. He is survived by his widow and a son, Julius W. Adams, Lakewood, Ohio, associated with the Westinghouse Electric & Manufacturing Company, at Cleveland, Ohio.

◆

L. S. Miller

Leverett Saltonstall Miller, who retired last July as president of the New York, Westchester & Boston Railway, died at the age of 67 on March 21 in St. Luke's Hospital, New York, of which his father, the late George MacCulloch Miller, had been president.

New York City was the birthplace of Mr. Miller and he attended private schools before entering Rensselaer Polytechnic Institute at Troy, N. Y., where he received the degree of civil engineer in 1885. He at once went West and joined the Denver, Utah & Pacific Railroad as maintenance engineer, and was later successively chief engineer, then assistant general manager of the St. Paul & Duluth Railroad, one of the receivers of the Washington Central, manager of the Seattle & International, assistant to President Thomas of the Erie, general manager of the Tennessee Central and general manager of the Central New England Railway.

This last position he resigned in May, 1909, to accept the presidency of the Millbrook Company, which built the New York, Westchester & Boston Railway, of which he became president on its completion. At the same time he was president of several affiliated transportation companies, among them the County Transportation Company, Soundview Transportation Company and the Port Chester-Glenville Bus Company. On his retirement he was succeeded by J. J. Pelley, president of the New York, New Haven & Hartford Railroad, which controls the suburban lines.

◆

William Early

William Early, secretary of the United Railways & Electric Company, Baltimore, Md., died on Feb. 25. Although he had not been well for some time, his last illness was of short duration, but he attended to his regular duties until a week before his death.

Mr. Early was a man of many attainments. He was quiet and unassuming, in manner a Chesterfield. He was kind and considerate but exact in his dealings. He was devoted to music and the arts, and had read widely.

He went with the United Railways & Electric Company in February, 1902, as secretary to the late Gen. John M. Hood, president of the company. Subsequently at the death of H. C. McJilton, secretary-treasurer of the United, Mr. Early was elected secretary of the company, continuing in that capacity until his death.

Mr. Early was a bachelor. His home on Calvert Street, Baltimore, adjoined that of his brother, Edward Early, who was assistant treasurer of the United company. Edward Early died suddenly in August, 1929. The brothers had been inseparable companions, and William Early is believed never to have fully recovered from the shock of his brother's death.

◆

Dr. Gustav Kemmann

Dr. Gustav Kemmann, well-known German consulting engineer and traffic expert, died in Berlin on Feb. 9 from a heart attack while he was making a trip on the street railway system. While he was connected with a number of enterprises, his outstanding work was in connection with the amalgamation of the elevated, subway and surface rapid transit lines, the street car system and the bus system, of Berlin, which took place in January, 1929. At the time of his death he had just completed an elaborate report of an economic study of the combined system, the Berlin Transportation Company, with recommendations for a new tariff.

Born in the Rhineland in 1858, Gustav Kemmann was educated in Germany and in England. After extended government service he joined the Deutsche Bank in 1897 as an expert on technical and scientific matters. In this capacity he traveled extensively in Europe and North and South America. In the financing of the project Dr. Kemmann was instrumental in laying out the Berlin elevated and subway system. He also was engaged in connection with many other transportation systems, including Hamburg, Vienna and Cologne. In 1918 the degree of doctor of engineering was conferred upon him by the Charlottenburg Technical School.

In connection with his work on the Berlin lines Dr. Kemmann became an authority on railway signalling. He was the author of two books on the subject, as well as many technical articles.

J. J. Larkin

John J. Larkin, superintendent of the signal division of the Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y., died recently of septic pneumonia at the Mary Immaculate Hospital, Jamaica, following an operation two weeks previously for appendicitis. He was 48 years old.

Mr. Larkin entered the employ of the company on April 27, 1906, when he was appointed a maintainer in the signal division. He had previously been employed by the Union Switch & Signal Company. His promotion to inspector of maintainers came a year later. He held that position for almost nine years and then was promoted to supervisor of maintainers. His ability as a leader and his complete knowledge of signal work led to his appointment as acting superintendent of the signal division in May, 1919, and on the first of the following year he was made superintendent of the division. Notwithstanding his long and practical experience as a signal maintainer, shortly before his appointment as supervisor of maintainers he enrolled for an evening course in applied electricity at Pratt Institute, Department of Science and Technology, and completed the course.

✦

C. S. Knight, Jr.

Charles Sanford Knight, Jr., sales manager of electrical and wire rope of the American Steel & Wire Company, Chicago, died on March 11. He was born in Worcester, Mass., June 15, 1864. At the age of fourteen years he entered the employ of the Washburn-Moen Manufacturing Company in Worcester, Mass., as a weigher and timekeeper. From that position he was advanced from time to time until he reached the sales managership of electrical wires and wire rope of the American Steel & Wire Company, successors of the Washburn-Moen Company.

✦

A. L. Valentine

A. L. Valentine, for the past seven years in charge of engineering work for the Seattle & Rainier Valley Railway, Seattle, Wash., died in that city recently. Mr. Valentine was born at Fontanelle, Iowa, in 1875. From 1887 to 1890 he was in the city engineer's office in Seattle; the next nine years were spent on the engineering staff of the northern Pacific Railroad. For nine years he was superintendent of public utilities in Seattle.

✦

E. D. Priest

Edward Dwight Priest, 70 years old, designing engineer in the railway department of the General Electric Company, died at Schenectady on March 26.

Becoming associated with the General Electric in 1892, Mr. Priest remained with the company until his retirement on Nov. 9, 1926. He was engaged in railway electrification problems and contributed valuable ideas to their development. As one of his first accomplishments, he conceived a type of railway motor which was particularly light in weight for use on elevated lines. He was the originator of the first box frame type motor marketed by the company.

The electrification of the Manhattan elevated in 1901 was an achievement of the group of which Mr. Priest was a leader, and he was also assisted in the work of designing the locomotives for the Baltimore & Ohio Railroad for use in the Baltimore tunnel some years earlier. When William B. Potter became railway department engineer in 1895, he appointed Mr. Priest designing engineer in charge of railway motors and he held that position until he retired. Mr. Priest contributed much to scientific and engineering progress by his participation in the work of engineering and affiliated bodies, among them the American Electric Railway Association.

✦

E. K. Stewart

Edward K. Stewart, former vice-president and general manager of the Columbus Railway, Power & Light Company, Columbus, Ohio, died at his home in that city on March 23. Mr. Stewart was born in Columbus and was educated in the public schools there. He had been identified with the railway systems in Columbus for 50 years. In 1867 he became secretary-treasurer of the East Park Street Railway in Columbus, and in 1892 he was made manager of the predecessor of the Columbus Railway, Power & Light Company. He resigned as vice-president and claim adjuster of the company at Columbus in 1919, having relinquished some time before that the arduous duties of general manager. Mr. Stewart was a veteran of the Civil War. He was 85 years of age.

✦

Alvan Markle, Sr.

Alvan Markle, Sr., banker and leader in the anthracite industry, is dead. Long a power in the coal mining industry in Pennsylvania, Mr. Markle was a capitalist and financier of great influence. His interests were far flung and he made his directing force felt in his posts as president of the Lehigh Traction Company, Hazleton; Wilkes-Barre & Hazleton Corporation and the Wilkes-Barre & Hazleton Railway. It was he who only last year stepped in to save Pennsylvania's pioneer high-speed third-rail line from probable suspension by tying it in more closely for affiliation in the handling of the production of the Markle mines.

✦

Walter B. Eubank, conductor of the first trolley car placed in regular service in Richmond, Va., in 1888, one of the first installations of its kind, is dead at the age of 70 years. He joined the company as a mule car conductor and remained active in the service of the company and its successors, including the present Virginia Electric & Power Company, until a few days before his death. He was exceedingly proud of his early association with Frank J. Sprague, A. Langstaff Johnson and other pioneers connected with the work at Richmond.

✦

John R. Mulcare, district manager of the American Car & Foundry Company, died at his home in Buffalo, N. Y., on March 14 following a brief illness. He was 58 years of age. He went to Buffalo ten years ago from Detroit where he had been associated with the company for thirteen years.

Edward P. Bradstreet, special counsel with the Cincinnati Street Railway, Cincinnati, Ohio, is dead. Although he had taken a very active interest in street railway affairs as a citizen for 70 years, Mr. Bradstreet did not become a regular employee of the railway until 1927. He was honored with the position of special counsel at that time as a reward for this keen interest in car riders' welfare. Mr. Bradstreet celebrated the 100th anniversary of his birthday last June.

✦

Joseph Tate, senior member of the brokerage firm of Tate & Hayes, New York, and president of the Eighth & Ninth Avenue Railroad, New York, died on March 13 at his home in Plainfield, N. J., following an illness dating back to January. Mr. Tate was born in Staten Island 81 years ago. He had been in Wall Street from boyhood and was associated with only one firm and its successors. The late James Closson was the senior member of the firm of Closson & Hayes, formed in 1870, and on his death years ago Mr. Tate succeeded him.

✦

Joseph S. Lovering Wharton, who had been associated with the foundry industry in Philadelphia for more than half a century, died on March 18 in his eighty-first year. Born in Philadelphia, he attended the Friends' School there and matriculated at the University of Pennsylvania, but left college to enter the J. S. L. Wharton Foundry, established by his father. This subsequently became the Harrison Safety Boiler Works and the Cochrane Corporation, of which he was president at the time of his death.

✦

Cortlandt H. Van Rensselaer, 61, formerly general superintendent of the Seneca Falls & Cayuga Lake Railway, Seneca Falls, N. Y., died recently in Philadelphia, following a brief illness.

✦

James E. Sullivan, foreman painter of the Ottawa Electric Railway, Ottawa, Ont., at its Champagne shops, died Feb. 7, in his 64th year. Mr. Sullivan was born at Potsdam, N. Y., and lived there 34 years. In 1900 he joined the painting staff of the company at Ottawa under Foreman Wilcox, then located at Rockliffe carhouse. On the retirement of Mr. Wilcox, Mr. Sullivan was appointed foreman painter.

✦

Samuel George, 62, prominent retired business man, died recently at his home in Wellsburg, W. Va. He was a former president of the Wellsburg, Bethany & Washington Railway.

✦

Harry P. Rogerson, Warwood, W. Va., general freight agent for the Wheeling Traction Company, Wheeling, W. Va., is dead. He was well known in railway circles in the upper Ohio Valley.

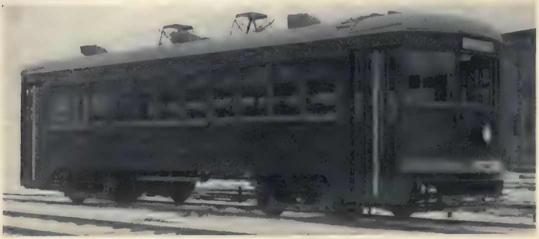
✦

John J. Shryock, president of the John J. Shryock Company, Meadville, Pa., and one of the original founders of the Meadville Street Railway and the Northwestern Pennsylvania Electric Company, which for many years operated railway service between Cambridge Springs and Conneaut Lake, Pa., died recently at his home in Meadville, following a short illness.

✦

Timothy W. Riley, chief inspector for the Springfield Street Railway, Springfield, Mass., for 30 years and an employee of the company since 1885, died in his home in Springfield recently after a short illness. He was 72 years old.

INDUSTRY MARKET AND TRADE NEWS

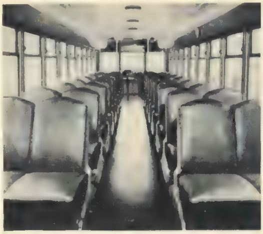

Exterior view shows automatic ventilators, six per car, and elevated trolley bases

Many Improvements in New Cars for Pacific Electric

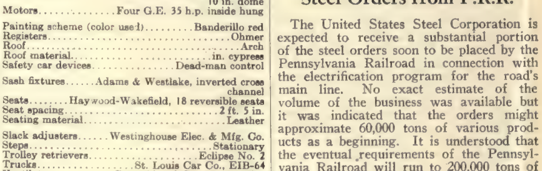
Fifteen new cars were placed in service by the Pacific Electric Railway on the local lines of Long Beach and San Bernardino during February. The cars were built by the St. Louis Car Company and sent to the Torrance shops of the railway where motors, air brakes, control and other electrical equipment were installed. These new units will replace the center entrance cars in Long Beach and all the Model 200 cars used in the San Bernardino local service.

Many improved safety features have been incorporated in the design. These comprise all-steel construction, unusually low step height, and rear-exit treadle doors. Power control is automatic, while the dead-man feature provides additional safeguard. Other specification details are: inclosed heating units, roller bearings, brake valve operated front door, cast-steel truck frames and improved dome type lights. These cars represent an investment of $250,000.

Details of specifications follow:


Reversible leather seats and plain arch ceiling give a neat interior appearance

Name of railway	Pacific Electric Railway
City and State	Los Angeles, Cal.
Number of units	15
Type of Unit	Two-man, motor, passenger, city.. double end, double truck.
Number of seats	40
Builder of Car body	St. Louis Car Co
Date of order	March 4, 1930
Date of delivery	December 6, 1930
Total weight	37,000 lb.
Length over all	38 ft. 3 in.
Length over body posts	28 ft.
Truck wheelbase	5 ft. 4 in.
Width over all	8 ft. 6 in.
Window post spacing	29 in.
Body	All steel
Roof	Arch
Doors	nd
Air Brakes	Westinghouse Traction Brake Co.
Armature bearings	Roller bearing
Axles	Forged carbon steel
Car signal system	Faraday passenger
Compressors	Westinghouse Elec. & Mfg. Co., DH-16
Conduit	Flexible
Control	General Elec. Co., automatic
Curtain fixtures	Curtain Supply Co., No. 89 pinch-handle
Curtain material	Double faced Pantasote
Destination signs	Hunter
Door mechanism	National Pneumatic Co.
Doors	Folding
Finish	Lacquer
Floor covering	Red Tuco Flexolite
Glass	D.S.A.A.
Hand brakes	St. Louis Car Co., drop handle
Heat insulating material	Hair felt, 1 in.
Heaters	Consolidated Car Heating Co..
Headlights	Golden Glow, SM-95
Headlining	¼ in. Agasote
Interior trim	Natural mahogany
Journal bearings	Fafnir-Melcher, roller bearings
Journal boxes	Cast steel
Lamp fixtures	Electric Service Supplies Co., 10 in. dome
Motors	Four G.E. 35 h.p. inside hung
Painting scheme (color used)	Banderillo red
Registers	Ohmer
Roof	Arch
Roof material	in. cypress
Safety car devices	Dead-man control
Sash fixtures	Adams & Westlake, inverted cross channel
Seats	Haywood-Wakefield, 18 reversible seats
Seat spacing	2 ft. 5 in.
Seating material	Leather
Slack adjusters	Westinghouse Elec. & Mfg. Co.
Steps	Stationary
Trolley retrievers	Eclipse No. 2
Trucks	St. Louis Car Co., EIB-64
Ventilators	Consolidated Car Heating Co. automatic
Wheels, type	Griffin
Diameter	26 in.
Wheelguards	H. B. life savers



Improvements insure safe operation with one or two men

Long Island Adds 359 New Steel Cars in Five Years

To keep pace with the steady growth of passenger traffic, the Long Island Railroad has added 359 all-steel cars to its passenger-carrying equipment, at a cost of $7,616,747, in the past five years. The Long Island has in service today, on all branches and divisions, a total of 1,429 passenger cars, all of which are of steel construction.

For several years only trains consisting entirely of steel cars have been operated in passenger service, the Long Island being among the first Class I railroads in the United States to eliminate the use of wooden-built passenger cars.

Out of 24,564 scheduled passenger and mail trains operated in February, 1931, only 43 were reported late in arriving at their respective terminals. This resulted in a performance of scheduled trains of 99.8 per cent perfect. The same percentage of trains was on time during the first month of the current year.

◆

Railway Erects Poles in Vancouver

The British Columbia Electric Railway is now erecting 30 poles of a new type along Cordova Street, Vancouver. These poles are being erected as an experiment. They are of light yet strong construction, and do away entirely with guide ropes. The type used is known as an expanding steel pole, and is manufactured by cutting a steel beam and pulling it apart under enormous stress. The poles cost $65 each in place and are guaranteed for a lifetime.

The installation is being made by the British Columbia Electric Railway at the request of the city of Vancouver. The poles will support the trolley wires and will also carry the metal lamp brackets used in the electric lighting system to be installed on Cordova Street.

◆

Steel Orders from P.R.R.

The United States Steel Corporation is expected to receive a substantial portion of the steel orders soon to be placed by the Pennsylvania Railroad in connection with the electrification program for the road's main line. No exact estimate of the volume of the business was available but it was indicated that the orders might approximate 60,000 tons of various products as a beginning. It is understood that the eventual requirements of the Pennsylvania Railroad will run to 200,000 tons of steel, of which half will be needed in the near future. Placement of these and other orders at this time is interpreted as indicative of increased confidence by buyers.

Bus Deliveries

Boston Elevated Railway, Boston, Mass., six A. C. F., 40-passenger, all-steel metropolitan type.

Capitol District Transportation Company, Albany, N. Y., two Twin Coach, small-capacity urban.

Chicago Surface Lines, Chicago, Ill., five Twin trolley buses.

Denver Tramway Corporation, Denver, Col., one Mack, Model BC.

Erie Coach Company, Erie, Pa., two Yellow Coach, 29-passenger, city service.

Houston Electric Railway, Houston, Tex., thirteen Twin Coach, small-capacity urban.

Johnson City Traction Company, Johnson City, Tenn., five Mack, 21-passenger, city type.

Lincoln Traction Company, Lincoln, Neb., four Mack, 29-passenger, city type.

Montreal Tramways Company, Montreal, Canada, one White, Model 65A.

Northern States Power Company, Eau Claire, Wis., five Mack, 25-passenger, city type.

Roanoke Railway & Electric Company, Roanoke, Va., four Yellow Coach, 25-passenger, city type.

Scranton Railway Company, Scranton, Pa., two White, Model 54.

Seattle Municipal Railway, Seattle, Wash., five Mack, 33-passenger, city type.

Third Avenue Railway, New York, N. Y., twenty White, Model 54A.

◆

Boston Elevated's New Buses Have Unit Frame Construction

Ten metropolitan type buses embodying the latest features in motor bus construction for the safety and comfort of riders have been received by the Boston Elevated Railway. Several have already been placed in service on the Bowdoin-Massachusetts station bus route. The balance will be placed on that route as soon as they are ready.

In addition to the front right-hand door, these ten buses have a door on the left-hand side in front in order that passengers may board and alight from the buses at Massachusetts station and at the stops at Arlington and Boylston Streets without crossing the path of traffic.

The buses are 31 ft. 2 in. in length and 96 in. wide. They will seat 40 passengers, which is the largest capacity of any bus operated by the Boston Elevated Railway. The body of the new type bus is all steel and is constructed in one unit instead of two separate units of chassis and body. The buses are equipped with six balloon tires, 40x9¾ in.

It is believed that the equalization of weight by means of springs will improve the riding qualities of the bus. The windshield is made of non-shatterable glass and has two full-length cleaners.

Members A.E.R.A.

Have you received application forms for exhibition space at the

Golden Jubilee Convention

of the

A. E. R. A.

Atlantic City, N. J.

Sept. 26 to Oct. 2, inclusive?

If not, communicate with
American Electric Railway Association
292 Madison Avenue
New York City

Closing date for the receipt of space requests

April 30, 1931

South Bend's New $350,000 Freight Terminal

Freight and traffic departments of the Chicago, South Shore and South Bend Railroad have been moved into new terminal. Two buildings were converted as inbound and outbound freight houses, and another was remodeled for office quarters.

Managers Appointed for New Departments of Westinghouse

To secure co-ordination of effort, the Westinghouse Electric & Manufacturing Company has announced the appointment of J. B. MacNeill as general manager of distribution engineering with headquarters at East Pittsburgh. This group comprises the engineering activities on switchboards, circuit breakers, meters, relays, high-tension insulators, and lightning arresters. The improvements in modern switching equipment covering high-speed circuit interruption at high voltages for purpose of system stability, the development of the "De-ion" circuit breakers, the apparatus for network operation of alternating-current distribution circuits, and isolated phase powerhouse equipment have been carried out under Mr. MacNeill's direction.

The new merchandising department has created the need for an executive to head the engineering activities involved in serving this department. T. S. Perkins will supervise these duties with the tile of general manager of merchandising engineering. In this position he will represent S. M. Kintner, assistant vice-president, in his work with supply, appliance, refrigeration, and illuminating engineering departments. Mr. Perkins was formerly general manager of distribution engineering.

Ten new type metropolitan buses of the Boston Elevated for use on the Massachusetts Station-Bowdoin route.

TRADE NOTES

Southern Wheel Company at a meeting of stockholders in Atlanta elected to the board of directors Robert T. Jones, Jr., L. W. Roberts, Jr., both of Atlanta, Byron C. Foy, vice-president of the Chrysler Corporation, Langbourne Williams, vice-president of the Freeport Texas Company, S. F. Pryor, Frederick W. Allen and William F. Cutler, president of the Southern Wheel Company.

✦

Haskelite Manufacturing Corporation announces the transfer of Joseph A. Potchen to the Eastern sales division in an engineering and sales capacity.

✦

H. W. Renick was elected president of Racor Pacific Frog & Switch Company, Los Angeles, Cal. Mr. Renick was formerly vice-president and succeeds J. B. Strong, who is now vice-chairman of the board of directors. The Racor Pacific Company manufacturers railroad switches, frogs, crossings, etc.

✦

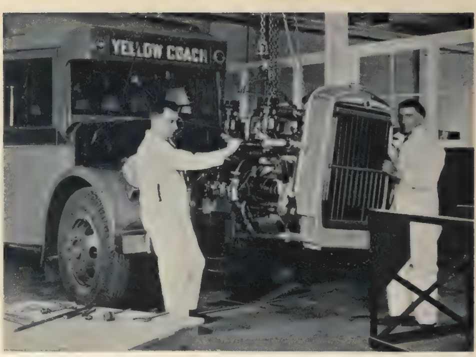
N. W. Eagles, formerly general superintendent of Graham Brothers, Chrysler Corporation, bus and truck plant, Evansville, Ind., has recently joined the Haskelite Manufacturing Corporation's sales force. Mr. Eagles will specialize in the sale of Haskelite and Plymetl in the bus body field.

✦

John D. Tyson, formerly assistant metallurgical engineer of the standard Steel Works Company, has been appointed chief metallurgist. Bradley Stoughton has been appointed consultant metallurgist. He was formerly professor of metallurgy at Lehigh University.

✦

General Cable Corporation has elected to its directorate Hamilton Brush, H. A. Guess, H. Y. Walker and K. C. Brownell, all connected with the American Smelting & Refining Company.



Two men can accomplish in 7½ minutes what formerly required hours.

Ease of Maintenance Offered in New Yellow Buses

Quick demountability of the power plant is a feature of the new intermediate Type V, parlor and city buses introduced by Yellow. Two men, in 7½ minutes, can remove the power plant including radiator, clutch and transmission as a unit, without disturbing any adjustments or removing the water from the radiator. Frames of increased strength and less weight, and more powerful brakes are other improvements incorporated in this design. Clutch is of the two plate type with holes in the bell housing for ventilation. The transmission is four speed with ground gears, and is of the unit power plant type.

American Steel & Wire Now Makes Preformed Wire Rope

The American Chain Company, Inc., in its annual report has announced that one of its subsidiaries, the American Cable Company, has concluded negotiations with the American Steel & Wire Company, a subsidiary of United States Steel Corporation, to manufacture preformed wire rope under a license agreement. The patents covering this material are owned by the American Cable Company. In addition, the company has concluded license contracts for the manufacture of this material with the General Cable Company; five rope manufacturers in Canada; British Ropes, Ltd., and its various subsidiaries, the largest manufacturers of wire rope in the United Kingdom, together with four other companies in Great Britain, Australian Wire Rope Works, Ltd., and Felton & Guilleaume, the largest producers of these products in Germany and Continental Europe. Negotiations are also pending for similar contracts with other wire rope manufacturers.

✦

Chicago Selected for Annual Meeting of A.S.T.M. in June

The 34th annual meeting of the American Society for Testing Materials will be held in Chicago, June 22-26, 1931. The papers committee assures a very interesting program for this meeting. A symposium on the effect of temperature on the properties of metals is expected to result in the assembling of a large amount of valuable information concerning the requirements of materials at high temperatures and the extent to which these properties are met by the materials now available. The symposium will be held under the auspices of the joint high temperature committee which has been developing data for it since 1924. There will also be symposiums on malleable castings, weathering characteristics of masonry materials and on abrasion of rubber.

Several of the technical sessions will be of the nature of joint meetings with other societies. The American Society of Mechanical Engineers will co-operate in the symposium on temperature effect. The American Foundrymen's Association and the Western Society of Engineers will take part in joint meetings.

Electric Railway Material Prices
March 27, 1931

Metals—New York

Copper, electrolytic, delivered, cents per lb.	10.00
Lead. cents per lb.	4.50
Nickel, ingot, cents per lb.	35.00
Zinc, cents per lb.	4.35
Tin, Straits, cents per lb.	27.00
Aluminum, 98 to 99 per cent, cents per lb.	22.90
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	34.25
General service	29.00

Bituminous Coal

Pittsburgh mine run, net ton	$1.40
Central, Ill., screenings	1.13
Kansas screenings, Kansas City	1.50
Big Seam, Ala., mine run	1.70
Smokeless mine run, Chicago	2.00

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Track spikes, $\frac{9}{16}$-in. and larger, per 100 lb.	2.80
Tie plates, steel, cents per 100 lb.	1.95
Angle bars, cents per 100 lb.	2.75
Track bolts, per 100 lb.	3.90
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	1.35

Hardware—Pittsburgh

Wire nails, per keg	$1.95
Sheet iron (24 gage), cents per lb.	2.35
Sheet iron, galvanized (24 gage), cents per lb.	2.90
Auto body sheets (20 gage), cents per lb.	3.20

Waste—New York

Waste, wool, cents per lb.	11.00
Waste, cotton (100 lb. bale), cents per lb.:	
White	8.00–12.00
Colored	7.00–10.00

Paint Materials—New York

Linseed oil (5 bbl. lots), cents per lb.	9.8
White lead in oil (100 lb. keg), cents per lb.	13.25
Turpentine (bbl. lots), cents per gal.	58.00
Putty, 100 lb. tins, cents per lb.	5.50

Wire—New York

Bare copper wire, cents per lb.	11.75
Rubber-covered wire, No. 14, per 1,000 ft.	$4.65
Weatherproof wire base, cents per lb.	13.00

Paving Materials

Paving stone, granite, 5 in., f.o.b.:	
New York—Grade 1, per thousand	$150.00
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd., f.o.b.	2.50
Paving brick 3½x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	50.00
Paving brick, 3x8½x4, N. Y., per 1,000 in. carload lots, f.o.b.	45.00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd., delivered	3.40
Cement, Chicago, in carload lots, without bags, f.o.b.	1.75
Gravel, ¾-in., cu.yd., delivered New York	3.40
Sand, cu.yd., delivered New York	2.15
Asphalt, in pkg. N. Y., f.o.b. ref., per ton	16.00

Scrap Metal—New York

Heavy copper, cents per lb.	7.00
Light copper, cents per lb.	6.00
Heavy brass, cents per lb.	4.00
Zinc, cents per lb.	2.12
Lead, heavy, cents per lb.	2.75
Mixed babbit, cents per lb.	3.00
Battery lead plates, cents per lb.	1.25

Old Material—Chicago

Steel car axles, net ton	$12.25
Cast iron car wheels, gross ton	10.75
Steel car wheels, gross ton	13.25
Leaf springs, cut apart, gross ton	13.25
Angle bars, gross ton	11.25
Brake shoes, net ton	7.50
Steel rails (short), gross ton	12.75
Relaying rails, gross ton (65 lb. and heavier)	24.50
Machine shop turnings, gross ton	4.50

The Motorman's last line of defence . . .

Peacock

Reg. U. S. Pat. Office

Staffless Brakes

Are direct, emphatic, sure in action. Fast on the take up, lots of power, never clog with chain, no matter how slack the rigging may be. They stop cars when they are called into action.

National
BrakeCo.,Inc.
890 Ellicott Square
Buffalo, N. Y.

General Sales Office:
The Ellcon Co., 50 Church St., New York
Canadian Representative:
Lyman Tube & Supply Co., Ltd.,
Montreal, Can.

THE ONLY RIM made for 18° and 28° BEVEL MOUNTINGS BOTH!

Goodyear builds rims to suit the convenience of those who use them.

If you want rims for 18° bevel mountings—we have them in *Type K-18.*

If you want rims for 28° bevel mountings—we have them in *Type K-28.*

Both rims are built on the same successful split base principle—which means greater speed in mounting tires and in taking them off—as well as safety, lightness with strength and many other advantages.

Type "K" rims cost no more than others—and they are the only type you can use straight through a fleet, on large wheels or small ones. That means standardization.

K-18 sizes: 5", 6", 7", 8", 9-10" and 11".

K-28 sizes: 5",6",7",8" and 9-10".

Will interchange with other types of rims using 28° single bevel mounting.

Give them a chance on your fleet —you can get a Type "K" rim for the wheels you are now using. Write to Rim Department, The Goodyear Tire & Rubber Company, Inc., Akron, Ohio.

"THE MAN WHO CHANGES TIRES LIKES "K" RIMS"

GOODYEAR

K-28 RIMS K-18

In Kansas City, Mo., the 76 buses of the Kansas City Public Service Company are equipped with Goodyear Tires

KANSAS CITY RIDES ON GOODYEARS

There's *nothing* unusual about one city which "rides on Goodyears" — not even when that city is Kansas City, where the Public Service Company's passenger coaches travel more than three million miles per year.

Such figures are simply part of a continued story — a report, month after month, year after year, of the transportation companies which find Goodyears better than any other tires for their operating conditions.

The total of all these stories *is* usual — because it shows that, in motor coaches as well as in passenger cars, "more people ride on Goodyear Tires than on any other kind."

Goodyears hold first place on the wheels of motor coaches because they are dependable carriers of passenger traffic. They keep rolling with fewer delays. They turn out the kind of transportation that builds business for coach lines and profits for operators.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS

● Never, in the history of highway transportation, has the necessity for a positive, powerful stopping force become more pronounced. As a natural consequence, Bendix-Westinghouse Automotive Air Brakes have never before enjoyed such overwhelming popularity. Manufacturers and operators alike have displayed a decided preference for Bendix-Westinghouse control. Such recognition is more than a silent tribute to the present effectiveness of Bendix-Westinghouse Brakes. . . . It is a vindication of the years of effort and painstaking research which have made possible modern braking standards. Bendix-Westinghouse Brakes are today an established feature of the world's most prominent vehicles. Their unchallenged superiority has made them in many instances, a part of motorized units whose operation would be impractical, if not impossible, without their tremendous power. Perhaps more specific information concerning the unusual jobs modern air brakes are doing would interest you. Your request for this information will receive prompt attention. Merely address the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE CO., at Pittsburgh, Pennsylvania.

BENDIX
WESTINGHOUSE
AUTOMOTIVE AIR BRAKES

TRUE TEMPER TAPERED RAIL JOINT SHIM

The Remedy for Low Joints caused by wear

The above shows Joint Shim in position with angle Bar removed

The above shows Joint Shim in position between Bar and Ball of Rail.

Other True Temper Products for Electric Railway Use:

- Safety Rail Forks
- Railroad Scuffle Hoes
- Ice Chisels
- Road, Gravel and Cleaning Rakes
- Sidewalk Cleaners

Send for a free copy of our Catalog RAD1, which describes these and other True Temper Products for Electric Railway use.

THE AMERICAN FORK & HOE COMPANY

General Offices: CLEVELAND, OHIO; Factory: NORTH GIRARD, PA.

District Offices
253 Broadway, New York, N. Y. Daily News Plaza, Chicago, Ill.
Representatives at
Boston, Denver, Detroit; Louisville, Minneapolis, St. Louis and San Francisco
Foreign Representatives
Wonham, Inc., 44 Whitehall St., New York, N. Y. and
68-72 Windsor House, Victoria St., London, S.W.-1.

Put your track equipment needs up to Bethlehem

Special car barn layout assembled before shipment in one of Bethlehem's spacious shops.

Bethlehem Silico-Manganese Crossing at 12th and Market Sts., Philadelphia, Pa.

Bethlehem No. 3-A Steel Ties used in double-track construction in a large mid-western city.

BETHLEHEM is prepared to meet the requirements of your construction program with safe, dependable track equipment. Many installations in widely separated sections of the country have demonstrated the reliability, low maintenance cost and satisfactory performance of Bethlehem Track Equipment.

■ BETHLEHEM SILICO-MANGANESE TRACKWORK.

This new trackwork is finding increasingly wide application for all locations including those where traffic conditions are unusually heavy. The Silico-Manganese intersection castings are Thermit-Welded to the rails making a solid, one-piece construction and eliminating the use of cast iron or bolts. The castings are heat-treated to harden them and increase their wearing qualities. This heat treatment gives Silico-Manganese Trackwork great resistance to initial pounding and wear. It has unusually long life and when worn is easily built up in the field by any of the standard methods of welding.

Temporary track construction with Bethlehem No. 3-A Steel Ties equipped with special base plates.

This Bethlehem "Grand Union" has been installed over 10 years at an important traffic intersection in an eastern city.

■ BETHLEHEM SPECIAL TRACKWORK.

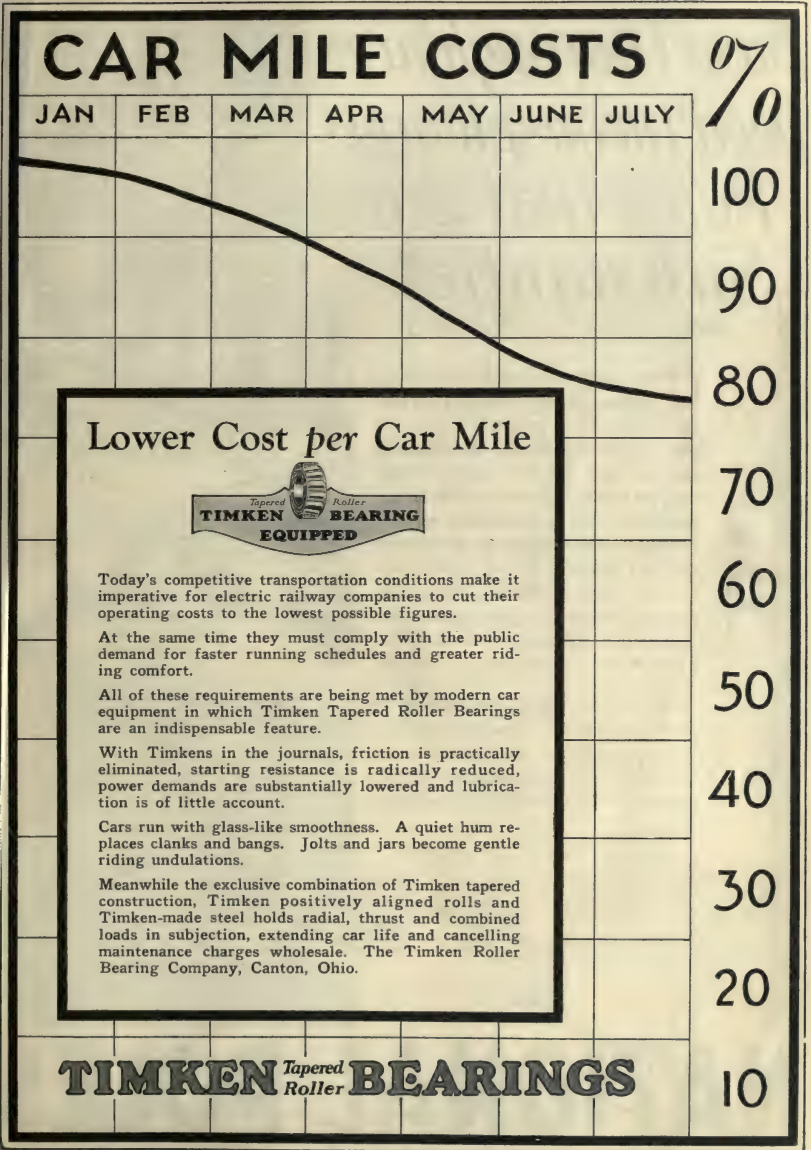
In the fabrication of special layouts, grand unions and car barn layouts, Bethlehem has introduced many improvements that assure easy assembly and correct fit of each piece in the field. Time and labor required for installation have been reduced, leading to substantial savings, especially where construction must proceed under traffic. Crossings, turnouts, special layouts, frogs, mates and switches are fabricated to your requirements.

■ BETHLEHEM STEEL TIES.

Steel Ties for concrete construction are made in a variety of sizes to meet the wide range of conditions and practices in the electric railway industry. These steel ties save time, excavation, concrete and labor in installation. Bethlehem now manufactures a special tie for laying temporary track on top of the paving, greatly speeding up construction work.

BETHLEHEM STEEL COMPANY
General Offices: Bethlehem, Pa.
District Offices. New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis.
Pacific Coast Distributor. Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.
Export Distributor. Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM



Lower Cost *per* Car Mile

Tapered TIMKEN *Roller* BEARING EQUIPPED

Today's competitive transportation conditions make it imperative for electric railway companies to cut their operating costs to the lowest possible figures.

At the same time they must comply with the public demand for faster running schedules and greater riding comfort.

All of these requirements are being met by modern car equipment in which Timken Tapered Roller Bearings are an indispensable feature.

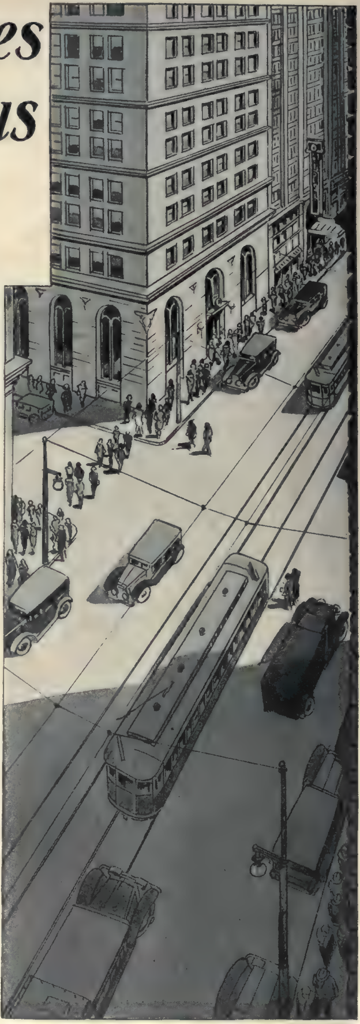
With Timkens in the journals, friction is practically eliminated, starting resistance is radically reduced, power demands are substantially lowered and lubrication is of little account.

Cars run with glass-like smoothness. A quiet hum replaces clanks and bangs. Jolts and jars become gentle riding undulations.

Meanwhile the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel holds radial, thrust and combined loads in subjection, extending car life and cancelling maintenance charges wholesale. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**

Busy Thoroughfares need Inconspicuous Poles that are Substantial



Good appearance is combined with adequate strength in NATIONAL Steel Poles. Good appearance—that the pole may harmonize with the surroundings in which it serves; strength—that the pole may be safe and insure safety of equipment used in connection with it. Neither of these important factors is in any way sacrificed for the other—both are fully regarded. Similarly, every other consideration that rightly governs the choice of line poles is given due weight in "NATIONAL" design and construction.

Made by the largest manufacturer of tubular products in the world. Available in varying designs and dimensions for practically any requirement. Ask for Bulletin No. 14, describing poles made from—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

US STEEL

NATIONAL POLES

100% TIMKEN

All Trolley Buses purchased during 1930 in the United States and its possessions

are equipped with

TIMKEN AXLES

FRONT and REAR

THE TIMKEN-DETROIT AXLE CO. DETROIT • • MICHIGAN

SUPERIOR
TROLLEY SLIDES

(In heavy service since 1924)

Economize
—On the Wire—

With Trolley Slides there is less wear on the wire. This is due to better contact and less pounding; hence no arcing. Also with slides there is less noise and better holding of the pole on the wire. This all saves money and affords better service.

Two types of Superior Slides can be obtained, the city type and the heavy duty interurban type. A back-up slipper can be applied where wire is high or the poles short.

Ask for Test Proposition

●

Heavy Duty Interurban Slide

Economize
—On the Slide—

Superior Trolley Slides are rugged and simple.

Compared with other slides, the Superior has a notable feature of economy; the removable steel contact insert, weighing but 7 oz. The smooth-grooved steel removable contact piece is mounted in a cast holder which oscillates about a bearing pin bolted in a harp.

The insert has all the depth (⅝ in.) required for giving long wear as compared with other slides, yet the renewal cost is very much lower because the Superior is so designed that when the wear tolerance is reached there is only a small amount of wastage.

Insert replacements can be made on top of the car in two minutes.

●

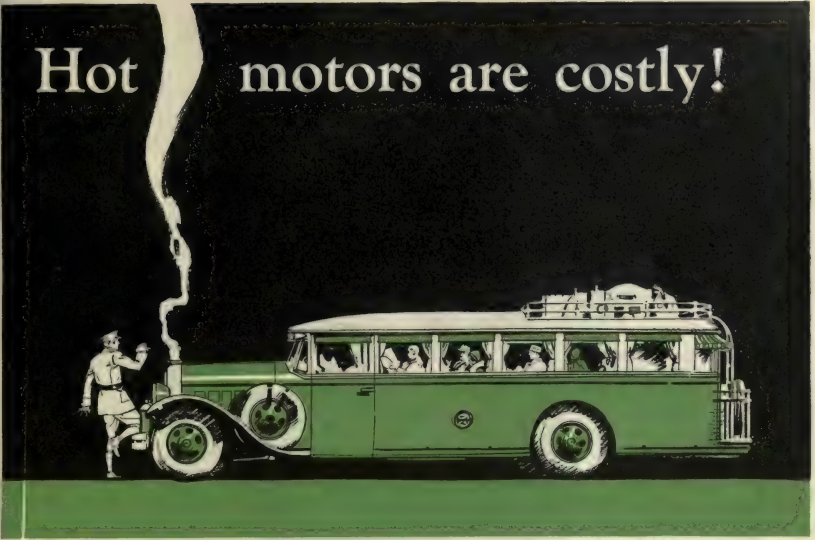
Economy Electric Devices Co.

General Distributors for

SUPERIOR TROLLEY SLIDES
ECONOMY RAILWAY METERS

37 West Van Buren St.
CHICAGO :: ILLINOIS

Rugged Light Weight Low Maintenance City Type Slide


Hot motors are costly!

Koolmotor Oil
Cools as it lubricates

COOL motors cost less to operate—repairs are fewer, maintenance costs are lower, road failures are negligible.

KOOLMOTOR Oil keeps motors cool. It is a double-service oil that *cools* as it lubricates. This rich, full-bodied, heat-resisting oil absorbs heat and carries it away from hot friction surfaces and bearings.

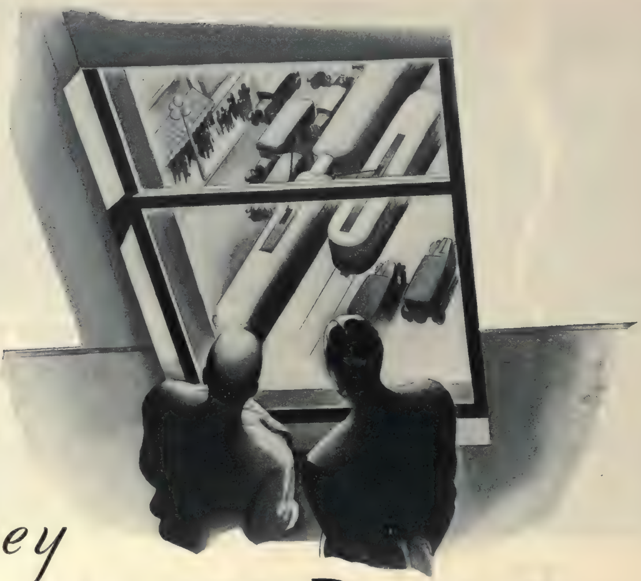
Your powerful, hot-running bus engines need this oil that *cools* as it lubricates. Our representative will gladly call and tell you more about its ability to lower your operating costs.

CITIES SERVICE COMPANY
60 Wall Street • New York City

CITIES SERVICE OILS
ONCE - ALWAYS

Cities Service Radio Concerts—
Fridays, 8 P. M., Eastern Standard Time, WEAF and 33 Associated Stations on N.B.C. Coast-to-Coast Network—Cities Service Orchestra, Cavaliers and Jessica Dragonette.

Cities Service Oils and Gasolene



They don't have to REMEMBER

CARNEGIE STEEL TIES

after their installation

TRACK problems may properly be forgotten where Carnegie Steel Ties are used in track construction. These ties provide the foundation for a smooth, repair-free track—a track that saves wear and tear on rolling equipment and greatly enhances its comfort. In many instances where Carnegie Ties have been in service for fifteen or twenty years, rails have been taken up for renewal to find the ties in perfect condition.

Plan to include Carnegie Steel Ties in your track construction program. Their unit cost (cost per foot of track per year) is considerably less than for wood ties. They will prove an investment you will remember with satisfaction—and forget with complacency, as far as troubles are concerned.

Catalogue on request.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

PITTSBURGH US STEEL PENNA.

86

MAINTENANCE

MAINTENANCE is a complex responsibility involving many intricate problems from road-bed and equipment to service, morale, and office discipline.

If investment values are to be sustained, the important task of maintenance can be entrusted only to those thoroughly experienced in every phase of the transportation business.

Car card advertising, too, is a highly specialized business. It is best maintained as a reliable source of income for the operating companies when it is in the hands of those who have proven their ability to so maintain it over a period of years.

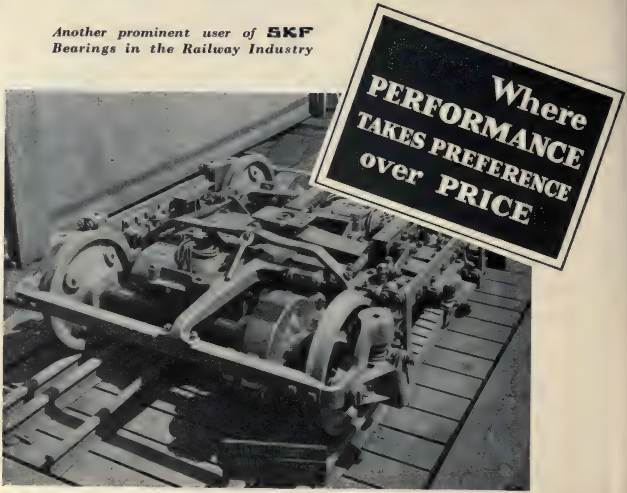
BARRON G.
COLLIER INC.
CANDLER BLD'G
NEW YORK CITY

CAR CARD ADVERTISING ALMOST EVERYWHERE

SELF ALIGNING BALL BEARING
DEEP GROOVE BALL BEARING
DOUBLE ROW DEEP GROOVE BALL BEARING
CYLINDRICAL ROLLER BEARING
SPHERICAL ROLLER BEARING
ALIGNING THRUST BEARING

THE TOOL STEEL GEAR & PINION CO.

Another prominent user of **SKF** *Bearings in the Railway Industry*



OPERATING ECONOMIES AND DEPENDABILITY WITH SKF

KEEPING close tolerances under hard operating conditions. One job especially suited to the SKF Bearings on the high speed shafts of the Tool Steel Gear and Pinion Company's reduction units on this Brill Truck.

SKF Bearings throughout a long life show little wear and never require adjustments. Smoother running and proportionate longer intervals between shoppings result. Such dependability plus reduced maintenance means more time on the road... greater operating economies.

SKF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.

2698

SKF

WHEN IT'S AN EXIDE . . .

BUSES START

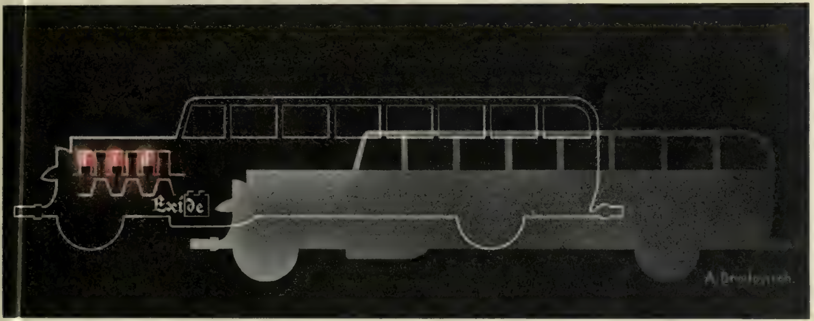
There is nothing temperamental about these bulldogs of the road

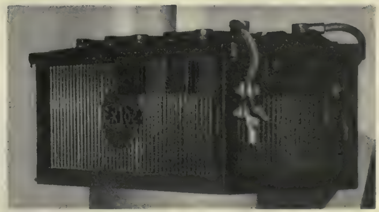
SLUGGISH motors or low temperature starting hold no terrors for Exide Motor Coach Batteries. When the driver's foot steps on the starter, the bus is off. Schedules are kept to the minute.

Motor coaches equipped with Exides assure passengers of adequate light and comfort, and safety too. These powerful batteries furnish reliable and efficient current, even in the hardest kind of service. Their rugged construction—long life—economy of operation and dependability have made them standard equipment on hundreds of motor coaches throughout the United States.

Why don't *you* take advantage of these Exide features—standardize on this battery too? Write for full information without obligation.

Exide
MOTOR COACH
BATTERIES





Note the rugged construction of this Exide Motor Coach Battery with the tough composition container that will not splinter, or rot from weather exposure or acid. It's a brute for punishment.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE
Exide Batteries of Canada, Limited, Toronto

maintenance must be lowered?

TAKE A LOOK
INTO YOUR
JOURNAL BOXES

Many a shop superintendent has found right there in the journal box the big chance to reduce costs. And not only to reduce maintenance but actually to improve the service.

A few years ago, dust and dirt worked havoc. High waste consumption, bearing troubles and frequent journal repairs were almost unavoidable. Today, with Texaco Lovis Oil and Texaco Oil Seals, these high maintenance items have been surprisingly reduced.

The Texaco System of car journal lubrication has worked wonders. Texaco Lovis Oil is a new and more effective low viscosity oil. Texaco Oil Seals permanently keep out abrasive dust and water. They are low in cost, including installation, and remain serviceable for years.

This system has the hearty endorsement of the officials of many of the country's leading roads where it is now in service. Write The Texas Company for full details.

TEXACO LUBRICANTS

THE TEXAS COMPANY
135 East 42nd Street New York City

Announcing type V

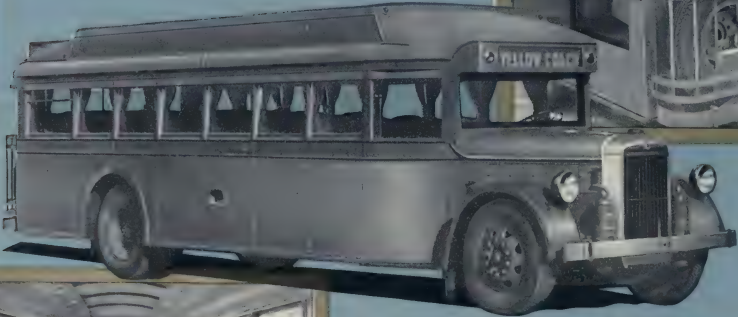
The new intermediate YELLOW

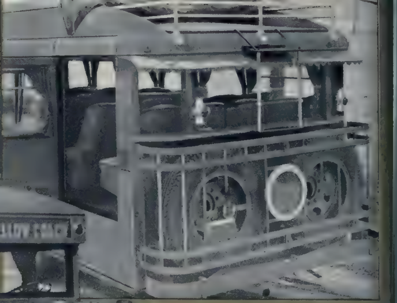
establishes _A New Measure_ for motor coach values

—with many new chassis features, new body features and new power plants. A truly great advance in coach engineering design.

29 Passenger Type V Parlor Coach on 225" wheelbase with 130 H.P. "525" engine.

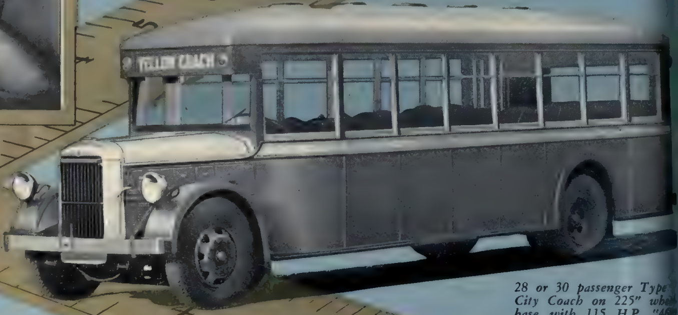
A 25 Passenger Parlor Coach is available on the chassis equipped with "468" engine.





Full observation rear. Built-in fully enclosed baggage rack. Large easily accessible emergency door. Tires mounted on frame extension.

Wide aisles, generous seat spacing, exceptional visibility for passengers.



28 or 30 passenger Type City Coach on 225" whe base with 115 H.P. "46 engine.

Measure These Values

. Appealing in design with equal utility.
. Stronger yet simplified construction.
. More power with less fuel.
. Easier handling with less effort.
. Faster schedules with greater safety.
6. Greater mileage with positive dependability.
7. Quicker, easier maintenance at less expense.
8. Greater passenger appeal and travel comfort.
9. More value for less money.

IN the new Type V you will find that Yellow standards of beauty, quality and workmanship are perpetuated and improved with many important engineering advances and an entirely new conception of performance, economy and earning power.

The chassis for the parlor coach and the city service coach are similar except for power plants. The "525" engine is used in the parlor coach where high speed and a surplus of power is required. The "468" engine is used in the city coach where adequate power must be coupled with maximum economy.

The frame is 12½ inches deep, of ¼ inch thickness with a 4 inch flange. There are seven cross members, four of which are tubular.

Clutch is of 2 plate type with holes provided in bell housing for ventilation. Clutch plates slide freely on splines, making gear shifting easy. Pedal adjustment easily accessible outside of frame.

The transmission is four speed with ground gears and of the unit power plant type.

Springs have triple wrapped spring eyes with safety bracket at rear of front spring.

Unusual braking power is provided by four wheel air brakes with four shoes equipped with detachable brake blocks in each wheel. Drums are 17¼ inch diameter 4 inches wide providing a brake lining area of 676 square inches. Braking effort front and rear easily varied to meet operating conditions with extremely low operating pressure required for stopping vehicle. Emergency brake internal expanding type working on drum mounted at center drive shaft bearing.

The bodies contain less material but are stronger and more rigid.

Side panels have lapped, watertight joints and are of rust-proof terne plate so installed that lower side panels or letter panels can be detached separately. Full length piano hinges are used on doors. All raised windows are easily and quickly removable from the outside.

Spare tires are mounted on a specially designed rear platform carried by the frame independent of body or rear bumper.

Floors are slightly ramped eliminating any uncomfortable seats around wheel housing.

Seats are wide with unusually liberal spacing.

The inside trim below windows is of scratch proof and fireproof material.

Heating is by forced induction through hot water heater with dash control. Unique ventilation is provided for driver by special duct below hood line leading to foot plate.

(Brief Specifications)

CHASSIS

CITY TYPE "V"	
Wheelbase	225 in.
Engine—6 cyl. 4¼"x5½" 115 H.P. developing 340 ft. lbs. torque	
Generator	12 volt 600 watt
Four wheel air brakes	
Tires	9.00"—22" balloon
Gasoline tank capacity	60 gallon
Standard gear ratio	5.57 to 1
PARLOR TYPE "V"	
Wheelbase	225 in.
Engine—6 cyl. 4½"x5½" 130 H.P. developing 380 ft. lbs. torque	
Generator	12 volt 600 watt
Four wheel air brakes	
Tires	9.00"—22" balloon
Gasoline tank capacity	60 gallon
Standard gear ratio	4.56 to 1

BODY

CITY TYPE "V"	
Overall length coach	30 ft.
Overall length body	23 ft. 1 in.
Overall width	96 in.
Headroom	76 in.
Floor height	28⅝ in.
Aisle width	20 in.
Seat width	35 in.
Seat spacing	30 in.
PARLOR TYPE "V"	
Overall length coach	30 ft.
Overall length body	23 ft. 8 in.
Overall width	96 in.
Headroom	76 in.
Floor height	28¾ in.
Aisle width	12 in.
Seat width	39 in.
Seat spacing	33½ in.

TWO NEW POWER PLANTS

The new "525" and "468" power plants used in the new Type "V" Coach are basically similar in design and construction to the famous Yellow 150 H.P. "616" engine. This engine has met the most exacting requirements of America's largest operators for performance, dependability, quietness of operation, ease of maintenance and unusual operating economy in millions of miles of service.

The new engines include all of the features of the "616"—zero lash automatic adjuster eliminating valve tappet noise and necessity of adjustment, detachable and interchangeable heads, counter balanced crank shafts, and oil coolers which reduce crank case and oil temperatures assuring better lubrication, longer bearing life and greater oil mileage.

Air pump mounted with flexible drive, pressure lubricated and together with fan, driven by dual belts from crank shaft. Wiring protected from heat by a special baffle plate.

A majority of the parts in these three engines are interchangeable. The engine accessories are easily removed or adjusted, contributing to simplified maintenance and a saving in labor.

7½ Minutes to Remove Power Plant

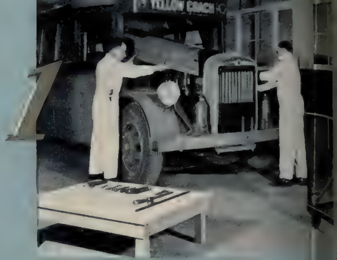
Two men, in 7½ minutes, can remove the power plant including radiator, engine, clutch and transmission as a unit, without disturbing any adjustments or even removing the water from the radiator.

Electrical, water, gasoline and exhaust connections specially fitted with quickly detachable joints. A few simple tools, an overhead crane, and an engine stand are all the equipment required.

This important and ingenious development means a material saving in maintenance costs, especially labor. Unit replacements can be made in a fraction of the time previously required and with fewer men. Coaches are out of service only a few minutes, for the removal and replacement of power plants.

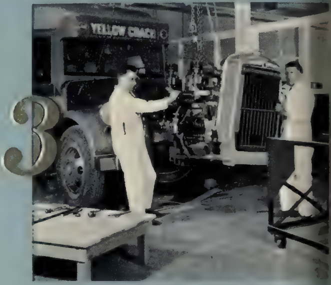
Inspect these new coaches. Appraise *for yourself* their greater earning power and lower operating cost. Then you too will say, "They establish a new measure for motor coach values."

GENERAL MOTORS TRUCK CO., Pontiac, Michigan
Subsidiary of Yellow Truck & Coach Mfg. Co.

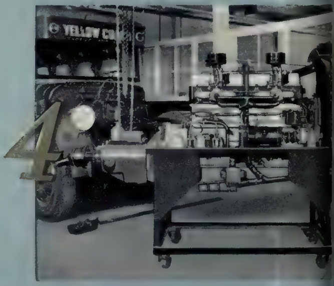


Two men—

In 7½ minutes—



Can remove the complete power plant unit



type V

YELLOW COACHE

IT'S THE SEAT THAT CARRIES THE PASSENGER

Type P-112

AFTER all its the passenger's comfort that is the first consideration on any public conveyance. Comfortable seats have much to do with rider attitude—finally with profitable operation.

Art Rattan seats are profit builders. First because they have an inviting look and are comfortable. They assure continued rider patronage.

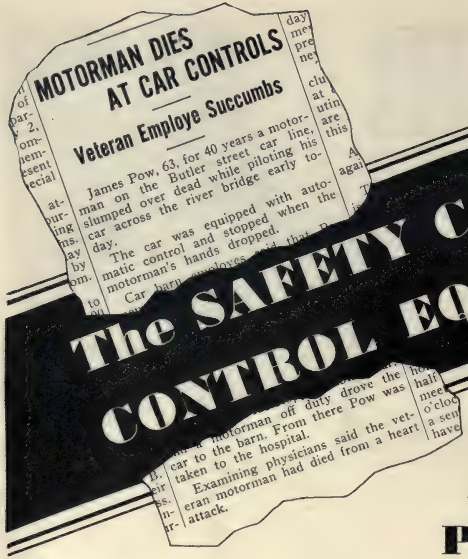
Second, they are sturdily built and require little or no maintenance. Figures from operators using Art Rattan seats show cost for repairs and maintenance is less than a fraction of one per cent of the total seat investment.

Want details? Write Art Rattan.

Art Rattan Works, Inc

Cleveland, Ohio........Oakland, California

Builders of De Luxe Bus and Street Car Seats



MOTORMAN DIES AT CAR CONTROLS

Veteran Employe Succumbs

James Pow, 63, for 40 years a motorman on the Butler street car line, slumped over dead while piloting his car across the river bridge early today.

The car was equipped with automatic control and stopped when the motorman's hands dropped.

Car barn employes said that

motorman off duty drove the car to the barn. From there Pow was taken to the hospital.

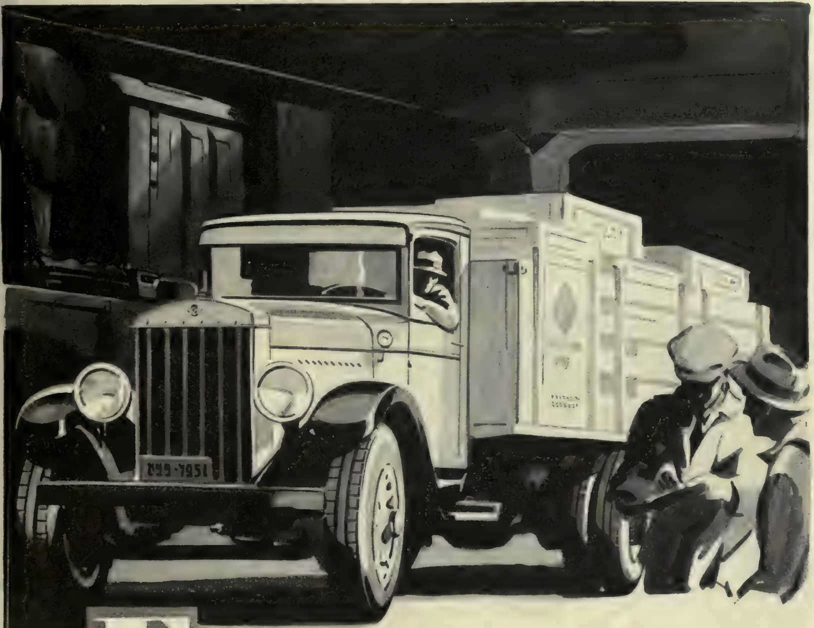
Examining physicians said the veteran motorman had died from a heart attack.

The SAFETY CAR CONTROL EQUIPMENT

▲ ▲ ▲ Strikingly Proves Its Value

HERE is an outstanding example of how a distressing incident can be prevented from becoming a disastrous accident . . . The death of this man *might have* entailed injury to others had the car not been equipped with mechanical apparatus designed to safeguard life and property in case of human disability, or even laxity. When the motorman's grip on the controller handle relaxed, this protective apparatus functioned to shut off the power and apply the brakes with full force, automatically . . . Such is the kind of safeguard afforded by modern cars that progressive street railway companies are now using. . . .

SAFETY CAR DEVICES CO.
OF ST. LOUIS, MO.
Postal and Telegraphic Address:
WILMERDING, PA.
CHICAGO SAN FRANCISCO NEW YORK
WASHINGTON PITTSBURGH



**Fitting Your Business—
Fitting Your Pocketbook**

Reo fits your haulage requirements by constantly introducing new ideas in bodies. ¶ Reo fits your pocketbook with economies resulting from its quick acceleration and deceleration in traffic—with further economies resulting from its all-day, all-year, long-life stamina.

Carefully engineered, with friction and vibration reduced—made of finer metals, and the chassis balanced and free of excess dead weight, Reo is needed in your business for the most profitable haulage.

REO MOTOR CAR COMPANY, LANSING, MICH.

SPEED WAGONS REO AND TRUCKS

How a famous manufacturer saved money with R B & W's PRECISE TOLERANCES

WHEN a world-famous maker of automotive axles started to purchase from us a nut that must be extremely accurate in size, we received instructions to work to certain tolerances, which left an allowance for lapping to size.

From previous experience, this customer was unable to buy these nuts completely finished to the accuracy and uniformity required, and so had been "lapping out" each nut, a costly procedure, but one which assured the desired result.

After receiving several shipments of nuts from R B & W, made with the lapping allowance, our customer's shop men discovered they were "lapping out" the identical amount from each nut, so closely were we adhering to a definite dimension within the tolerances specified.

Surprised at the uniformity that was being maintained in the R B & W product, the customer finally changed the tolerance specifications to those required in its finished nut, and eliminated the expensive "lapping out" operation in its own plant.

RESULT: Reduced cost of product, with no decrease in quality.

If you have an engineering problem involving the use of bolts and nuts, let us make suggestions based on 86 years of experience in the manufacture of quality products to meet every demand of industry.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N.Y.
ROCK FALLS, ILL.
CORAOPOLIS, PA.

R B & W.
EMPIRE
BOLTS & NUTS

Sales Offices at Philadelphia, Detroit, Chicago, San Francisco, Los Angeles, Seattle, Portland, Ore.

Goodrich HEAVY DUTY Silvertown
"... for the COMFORT of our passengers"
Goodrich HEAVY DUTY

Safety Transit Company finds Silvertown Balloons RIDE EASIER ... SAVE EQUIPMENT give BETTER TRACTION ... SURER BRAKING

SUCCESSFUL bus operators find that more riding comfort per bus mile means more revenue per bus mile. That is why Safety Transit Company chooses Silvertown Balloons for its coast-to-coast service.

Says Assistant Manager Robert B. Brown, "*Goodrich Silvertown Balloons are our choice of equipment primarily for the comfort of our passengers . . . and for the additional factors of better traction, braking, and saving to our equipment . . . Goodrich Silvertowns . . . are giving us the best service and most mileage of any tire we have ever used.*"

For luxurious comfort, for lower maintenance costs, for safety and for mileage, equip your buses with Silvertown Balloons.

The B. F. Goodrich Rubber Co., Est. 1870, Akron, Ohio. Pacific Goodrich Rubber Co., Los Angeles, Calif. In Canada: Canadian Goodrich Co., Ltd., Kitchener, Ont. The International B. F. Goodrich Corp. (Export).

BUS OPERATORS

say:

"We are entering our fifth year on Goodrich 100%"

"30% more mileage"—"10 miles per hour faster"

"Repair costs cut"—"Less driver fatigue at 5:30 P. M."

"Goodrich Tires have played a vital part in helping us to expand our operations and maintain our schedules"

"Out of 301,600 trips—3,784,007 bus miles per year—only 10 trips lost due to tire trouble"

"The finest tire we know of for trouble-free mileage"

Goodrich HEAVY DUTY Silvertowns

SPECIFY GOODRICH

GUY C. SMITH

Manager of Advertising and Research

Libby, McNeill & Libby

"Any American advertising manager who wants to learn the value of the Audit Bureau of Circulations need only start buying newspaper space in foreign countries. The impossibility of knowing accurately, without special and costly research, the amount and breakdown of circulation of publications in any other country, is a sharp contrast to the information which has become available to advertising in this country by reason of the work of the A. B. C.

"But the Bureau needs the support of every important user of publication space. In my opinion it has not begun to reach any limit of its usefulness. I consider it one of the most fundamental advertising expenditures our company makes."

Guy C. Smith

BERNARD LICHTENBERG

***Vice President*, Alexander Hamilton Institute**

"Buying advertising space in newspapers and periodicals without referring to A. B. C. circulation audits is like buying a pig in a poke. The old time farmers never traded horses blind.

"The earnest attempt on the part of such organizations as the Incorporated Society of British Advertisers, the Australian Association of National Advertisers, the German Reklame-Schutzverband, and the Mexican Asociacion de Annunciantes, among others, to form an Audit Bureau in their countries based on our own A. B. C., is an indication of the fact that thoughtful advertisers around the world have seen the worth of such an organization."

Bernard Lichtenberg

● Twenty years ago there was chaos in advertising. Nobody knew what his dollars bought—whether a thousand readers or ten thousand. Nobody, except by infinite pains and shrewdness, could find out.

Could advertising, on that basis, ever have grown to its present importance? Would business ever have rested its trust in a sales weapon of metal so doubtful in assay?

Hardly, think men who today direct advertising expenditures that total millions. Through such leaders as these the Audit Bureau of Circulations came to be organized. And largely through the activities of the Bureau, there is order today in the buying of advertising space.

Once a year now, into almost every important publication office, go the auditors of the A. B. C. Every circulation record is open to them. To no publisher, no agency are they responsible. They work directly for the Audit Bureau of Circulations, and on the directorate of this institution a majority must be advertisers.

The Bureau's Audit Reports thus give the detailed findings of experts controlled by advertisers. They bring to light the complete circulation facts.

Can any budget yield full returns without use of this only recognized method of appraising advertising space?

Can any important advertiser, whether national or local, afford to be unrepresented upon the membership roster of the Audit Bureau of Circulations?

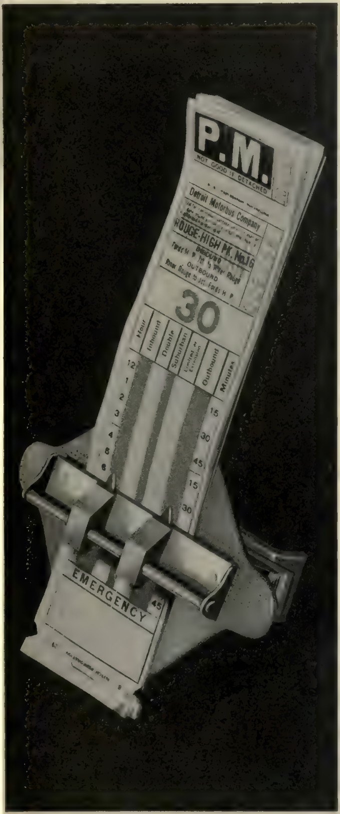
AUDIT BUREAU OF CIRCULATIONS ABC INCORPORATED

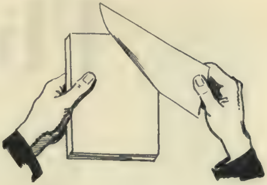
An Advertisement by the

AUDIT BUREAU OF CIRCULATIONS

Executive Offices • • • Chicago

JUST AS EASY...





. . . as tearing a sheet of paper from a pad . . . .

The new Globe "No-Punch" Tearoff Transfer

is rapidly replacing older forms. In fact, over a hundred properties have recently changed over to this and similar Globe forms. The number is increasing constantly.

Why? Because—

It eliminates lost time at transfer points; requires no punches; tells at a glance whether time limit has been exceeded, prevents round tripping and other fare abuses; —and results in increased revenue to the company.

The Hyman Cutter here shown was specially designed for this style transfer.

Let us explain more fully.

GLOBE

TICKET COMPANY

PHILADELPHIA

Factories:
Philadelphia Los Angeles Boston New York Atlanta
Sales Offices:
Syracuse Cincinnati Pittsburgh Baltimore Cleveland St. Louis Des Moines

The Quality

**"NATIONAL"
ELECTRIC
RAILWAY
Specialties**

Let our specialists cooperate with you. Due to long contact with the industry we have valuable operating data that is available for the asking. Prices and full details submitted upon request.

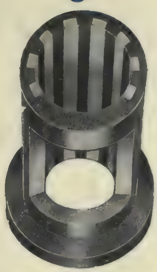
Approval

given these products tells the story of a long and SUCCESSFUL Service Record

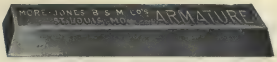
"NATIONAL" Electric Railway Specialties have saved operating dollars for the electric traction industry for more than fifty-five years. This achievement was possible because of the quality we incorporated into these specialties at the start and carefully preserved.

Whatever your plans are for replacement or modernization you can be sure of successful and economical results by including "National" Electric Railway Specialties.

We have, by long and careful research and experimentation in well equipped laboratories, saved you the trouble and costs of making frequent tests to attain satisfactory results. Our specialties have been tested under all conditions. Regardless of your problems today they will fulfill your needs in every way.

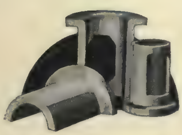


The "Vigne" Bimetallic Armature Bearing



"Armature" Babbitt Metal

"More-Jones" Trolley Wheels and Harps



"Tiger" Bronze Axle and Armature Bearings

NATIONAL
Bearing Metals
Corporation

ST. LOUIS, MO.

New York, N. Y.
Meadville, Pa.
Jersey City, N. J.
Portsmouth, Va.
Pittsburgh, Pa.
St. Paul, Minn.

Padlocked Minds

have no use for a Business Paper...

IT'S not so much *what* you read that counts, as what you read it *for*.

Reading to pass the time away is *one* thing—reading to get *ideas* for improving your business is another.

Men completely satisfied with what they have—insensible to progress—oblivious to change—these read (*when* they read) for entertainment only.

But men whose minds are open to better methods, men whose minds are eager for news of new plans and new practices—these are the men who read the pages of their business papers.

In any industry . . . trade . . . profession, these are the men who count. And just as they are attracted to a publication by the practical, helpful character of its editorial content, so, in the same open-minded mood, they read its advertising pages.

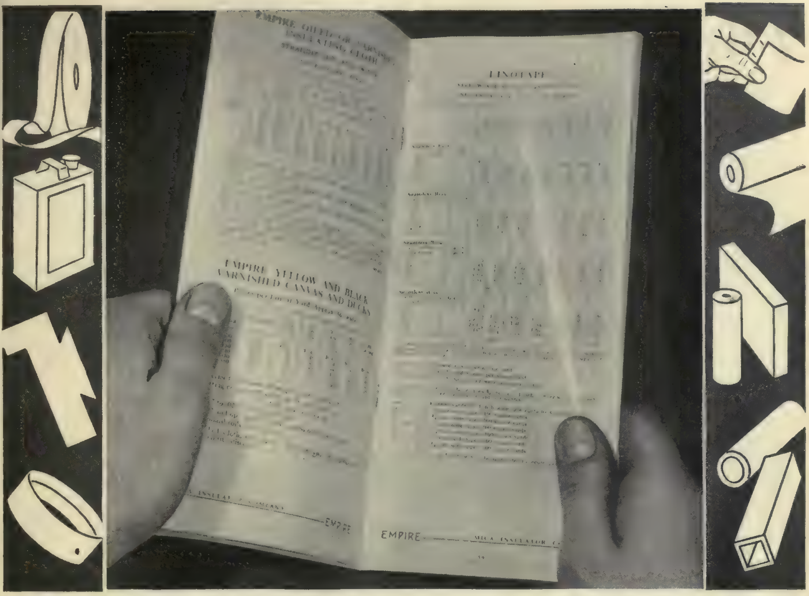
ABP

THIS SYMBOL *identifies an ABP paper . . . It stands for honest, known, paid circulation; straightforward business methods, and editorial standards that insure reader interest . . . These are the factors that make a valuable advertising medium.*

THIS PUBLICATION IS A MEMBER OF

THE ASSOCIATED BUSINESS PAPERS, INC.

TWO-NINETY-FIVE MADISON AVENUE - NEW YORK CITY


EMPIRE YELLOW AND BLACK VARNISHED CANVAS AND DUCKS
LINOTAPE
EMPIRE
EMPIRE

"*At your finger tips*"

. . . the latest information

List prices, quantity discounts, a condensed description and recommendation for the use of more than 120 indexed insulations are contained in this booklet. It has been issued for the convenience of electrical manufacturers and repairmen, offering one source of supply for all electrical insulating materials.

As the prices of raw materials vary and necessitate new prices for the insulations sold by the Mica Insulator Company, revised editions of this price list will be printed.

If you have not received a copy of this price list No. 89, write and we will send you one. Every recipient will automatically receive revised copies as they are issued and thus have the latest data at his finger tips.

MICA INSULATOR COMPANY
New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Cleveland Pittsburgh Cincinnati San Francisco Seattle
Birmingham Los Angeles Montreal and Toronto, Canada
Works: Schenectady, N. Y. London, England

MICA INSULATOR COMPANY

Electrical Insulations

PERFECT LAMICOID — PERFECT MICANITE INSULATOR — PERFECT EMPIRE INSULATOR — PERFECT MICO INSULATIONS

A COMPLETE LINE FOR EVERY PURPOSE

The Improved Type EAS Bond

. . . the new rounded-sleeve terminal

. . . the improved appearance

. . . the gradually increasing grip on the cable between the bond loop and the zone of weld

. . . more effective damping of vibration in cable

. . . increased bond life

. . . a machine applied bond

. . . it's Brazed.

The Electric Railway Improvement Co.

2070 E. 61 St. Cleveland, Ohio

Representatives At

New York • Boston • Chicago • Salt Lake City • San Francisco • Portland

FEATURING
LOW INITIAL INVESTMENT

The New
FITZJOHN BODY
Expressly Designed for
157-inch Wheelbase

FitzJohn
Motor Coach Bodies
Command the Highways

FITZJOHN MANUFACTURING CO.
MUSKEGON, MICHIGAN

LOW OPERATING COST

On the "Crimson Limited" and on the city cars in Fort Worth, Texas - - - -

MILLER TROLLEY SHOES

3-inches of smooth sliding contact . . . steady power . . . fewer dewirements . . . no oiling required . . . no moving parts to get out of order.

The Northern Texas Traction Company—winner of the Coffin award in 1924—has been using Miller Trolley Shoes for the past *ten years* on all their rolling stock. The smallest city cars as well as the big "Crimson Limited" fliers which run from Fort Worth to Dallas—are all equipped with these smooth-running sliding contact shoes.

Here is why they continue to use them! . . . "The operation of Miller Trolley Shoes results in a marked decrease in overhead trouble such as trolley breaks, loose hangers, etc., with a corresponding decrease in costs" . . . and "Miller Trolley Shoes ride the wire much better than wheels and give greater contact on the wire which results in our being able to draw a higher current at high speed without arcing," . . . and "Due to better riding quality of Miller Trolley Shoes we save a sufficient amount in trolley poles alone to warrant their use."

A few clean-cut statements like these, from a user, are more convincing than all the claims the manufacturer can make for this device. The Northern Texas Traction is only one of several Stone & Webster railway properties that use Miller Trolley Shoes. Many other prominent electric railways are also on the list.

Further information and quotations on request.

MILLER TROLLEY SHOE CO.
Columbia Road, Boston 21
Massachusetts

Simplex

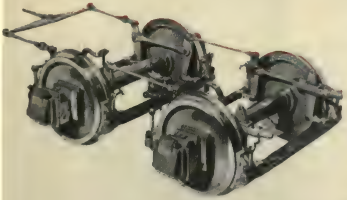
Multiple Unit Clasp Brakes

Speed is today's byword. Greater Speed, faster service, better schedules—these are the demands on practically every transportation organization today.

Without a doubt deceleration is as important a factor in maintaining schedules as acceleration or running speed. It's the *most important* factor where speed with safety is concerned.

Simplex Multiple Unit Clasp Brakes offer today's method of braking to meet today's demands in speed. Two brake shoes per wheel *double* the braking area and *halve* the wear on braking equipment.

Balanced braking has *many* advantages. Study the features outlined here. Details and blueprints will be sent at your request.



AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

ASF

SAVE MONEY WITH THE

STANDARD OIL COMPANY OF NEW YORK

SOCONY 3

1 **SOCONY GASOLINES:** Banner, most popular in the non-premium field; Socony Special *plus* Ethyl, most popular in the premium field. For bus operation "Special" is brisker, livelier! It gives added power. It lessens gear shifting. It reduces the amount of "choke" gasoline in your crankcase. It will not knock on the steepest of hills—IT SAVES YOU MONEY.

2 **NEW SOCONY MOTOR OIL:** A completely dewaxed, 100% paraffine base oil that flows freely and maintains the proper body at *all* temperatures. Reduces wear in your engine. Gives perfect piston seal, maximum power, minimum gasoline and oil consumption. Try it today. IT SAVES YOU MONEY.

STANDARD OIL COMPANY OF NEW YORK

3 **SOCONY GEAR OIL:** For proper gear lubrication, change from the light winter grade of gear oil to a heavier grade for spring and summer operation. Have the Socony man flush out the transmission and differential of your buses before refilling with fresh Socony lubricant. IT SAVES YOU MONEY.

STANDARD OIL COMPANY OF NEW YORK

SAVE WITH SOCONY THIS SPRING

Typical traffic scene where Thermit Welding was carried on without removal of car traffic.

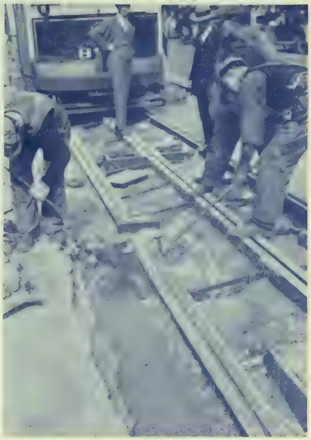
NOW

THERMIT WELDING
Under Traffic

Any Headway
Any Conditions

ONLY 3 MINUTES

actual welding time . . . . !



Removing cope after pour to
permit car to pass.

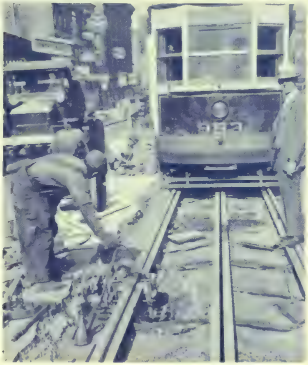
Thermit Weldin

The Result of Three Years Development on Five Different Properties

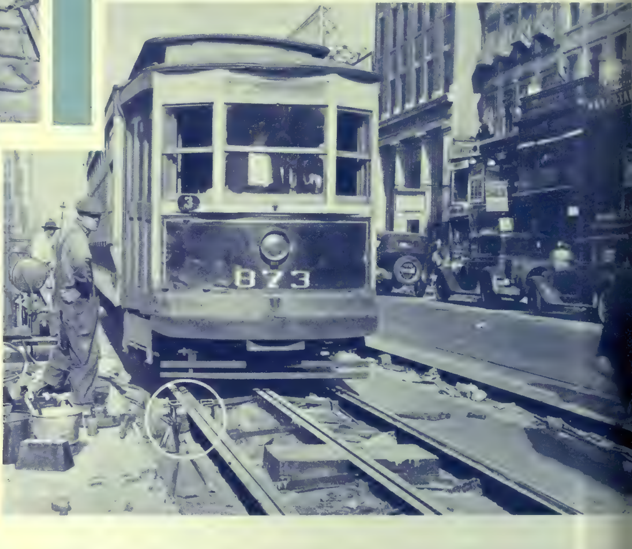
BACK IN 1928 the first practical rail welds were made "und traffic," on tracks of the Third Avenue Railway in New Yor Prior to that time experiments had been made, but this w the first work done on a larger and more practical scale. Here th traffic conditions are most exacting. Cars run on close headwa Street traffic is congested. The picture on the preceding page typical. Underground trolley structure in connection with th track, further complicates the problem.

Such unusually severe conditions for the development of ra welding-under-traffic were ideal from the standpoint of the Metal Thermit Corporation. Here our engineers could keep each jo under closest scrutiny, both during the operation and afterwar Having finally developed the process to a point where it was entirel satisfactory, many thousand joints were installed. Then use wa extended to several other electric railways where the conditio were different, in order to prove the process under all classes service.

Where this method of welding has been introduced it has met wit excellent success. On five of the largest electric railways in th United States it is now in regular use. The policy of the Metal



Removing heating cover to
permit car to pass.



Preheating operation—showing
car about to pass.

Under Traffic

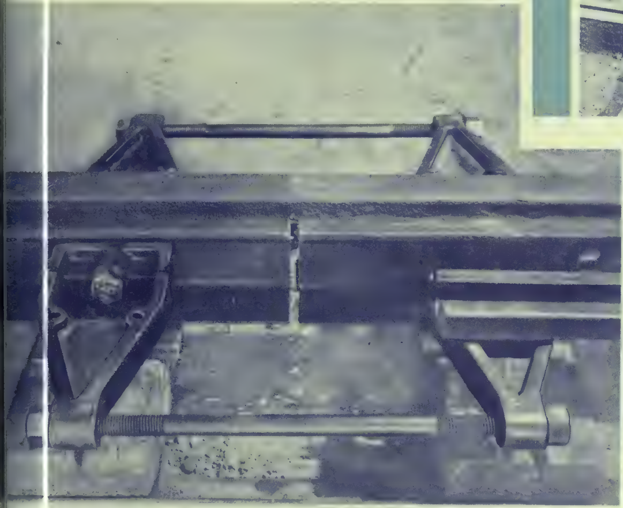
ermit Corporation, of thoroughly trying out any process before roducing it generally, has been justified. Now it is established as actical and economical on all types of construction and for use der the varying conditions met with in different cities. Now it is dy for general use.

lding under traffic, as accomplished by this process, requires no dges, side tracks or any other special equipment for taking the s off the rail. The cars continue operation over the rail *all during process of welding.* Three minutes has been established as the rage time required to keep cars off the joint during the process "pouring" the weld and removing the top section of the mold; n the cars can proceed in the regular way. By a new mold design a patented method of holding the rail ends, the cars are enabled run directly on the rail during the entire process except for that ee minutes of actual welding time.

e process itself is just as easy and simple as the standard method Thermit rail welding. While we recommend it primarily for reiming old track, it is just as satisfactory for welding on new conuction work where service over the track must be maintained. In lding old track there is usually space between the rail ends, and insert conveniently fills up this gap. On new construction the ert or undercut method can be used except that with the under- method, clamps such as our standard Hercules or Birmingham e clamps, are necessary.

Lifting heating cover to inspect heat in rail.

Rail spread with slow taper wedge and insert being driven in.



Clamps used to hold rails in compression with undercut method.

Of course it costs more to carry on welding operations under traffic . . . .

BUT, it generally proves cheaper when compared with the cost of night work, overtime, re-routing of cars, or interfering with schedules. Savings on these items may more than offset the extra cost of rail-welding-under-traffic. Naturally no method of welding which is carried on with traffic interference is as economical as where traffic is removed from the tracks.

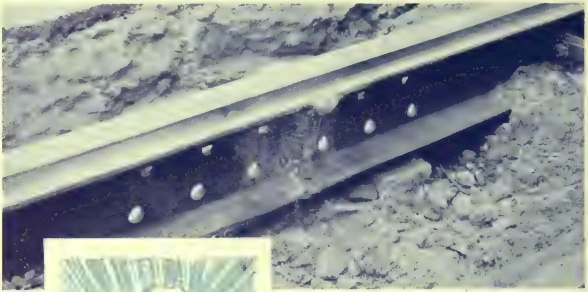
This method of welding enables you to make welds during the day, even on streets with close headway, and eliminates for many companies the necessity of night work under adverse conditions.

As stated before the process itself is just as easy and simple as the standard method of Thermit rail welding. The materials are just the same.

While this process of rail-welding-under-traffic is covered by patents and patent applications, *it is free to users of Thermit.*

Metal & Thermit Corporation engineers are at your service to explain the details and apply the process *under your conditions.*

Weld completed and cope removed ready for car to pass.

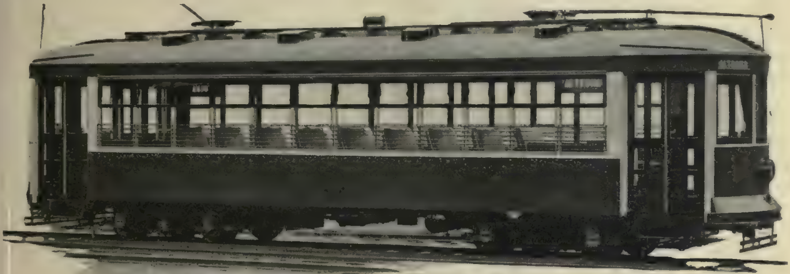


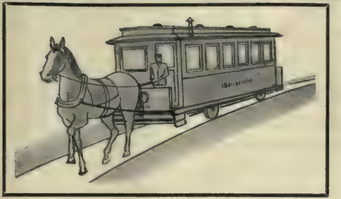
Finished Thermit weld, ground and cleaned.

The
METAL & THERMIT
CORPORATION

120 Broadway, New York, N. Y.
Pittsburgh Chicago Albany So. San Francisco Toronto

Long Experience is Important Factor





What serves its purpose today becomes obsolete tomorrow. The wheels and axles of cars of the last century were good enough. Today's equipment would never do for the car of the future. The manufacturer of railway equipment as well as the operator must keep pace with development. "Standard" always has and always will.

STANDARD STEEL WORKS COMPANY

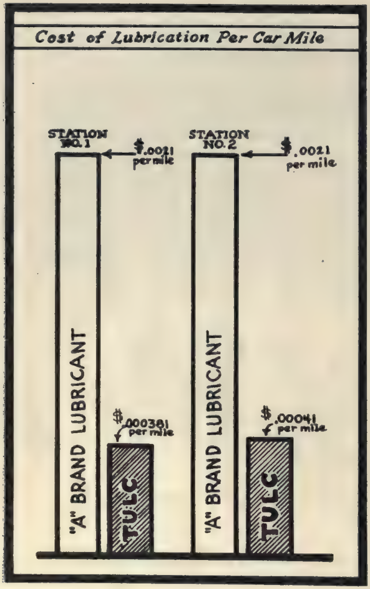
GENERAL OFFICES AND WORKS: BURNHAM, PA.

CHICAGO
NEW YORK
AKRON

SAN FRANCISCO
PORTLAND

RICHMOND
ST. LOUIS
PHILADELPHIA

"One Picture Is Better than a thousand words . . . ."



AT the left is a picture that tells more than words about the superiority of "TULC" for electric railway journal bearing lubrication.

It's the boiled down result of a comparative test made by a large street railway company, using TULC in competition with a well-known high quality lubricant. It proves the low cost per thousand car miles when TULC is used in Journal boxes.

They found that TULC had numerous other advantages such as breaking in new bearings at a lower temperature—that "A" Brand Lubricant required repacking and renewal while TULC did not—and TULC ran 4,105 and 7,516 miles without requiring additional oil. Power Consumption being important it is interesting to note that TULC lubricated cars required 1.5% and 3.2% less K.W.H. per car miles.

If you are interested in making a test of TULC, write:

TULC
A
LUBRICANT

MAKE A TEST WITH "TULC"

The Universal Lubricating Co.

Cleveland, Ohio

By millions of miles of tested travel—light loads and heavy, on all kinds of roads—truck operators have demonstrated the basic economy of U. S. Royal Heavy Service Balloons—longer mileage, fewer road delays, decreased operating costs. That's why so many far-sighted truck operators have joined the Big Swing to U. S. Tires.

UNITED STATES RUBBER COMPANY WORLD'S LARGEST PRODUCER OF RUBBER

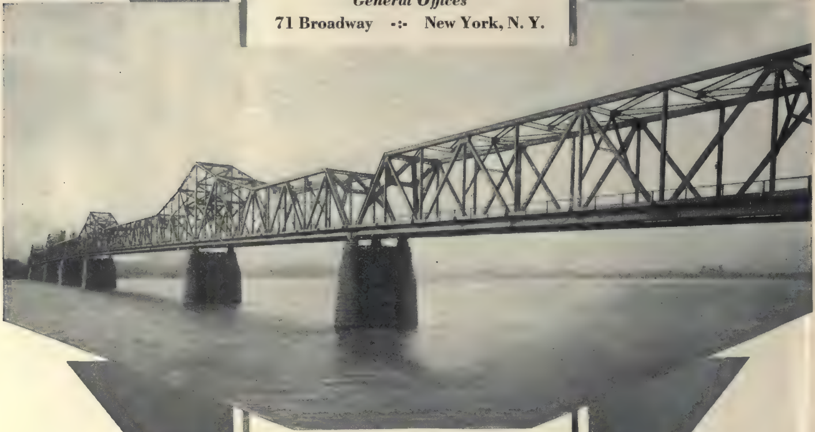
ANOTHER LARGE HIGHWAY BRIDGE
over the
OHIO RIVER
(Illustrated Below)

was opened to traffic the latter part of 1929. This bridge for the Louisville Bridge Commission, is 3740′ long, connecting Louisville, Ky., and Jeffersonville, Indiana. The fabricated structural steel in the superstructure was furnished and erected by

AMERICAN BRIDGE COMPANY

Subsidiary of
United States Steel Corporation

General Offices
71 Broadway -:- New York, N. Y.



RALPH MODJESKI FRANK M. MASTERS
Engineers

This structure consists of two cantilever structures,—each made up of one anchor arm 362 feet, one anchor arm 500 feet, two cantilever arms each 224 feet, and one suspension span 373 feet,—and one simple span 373 feet, similar to suspension span; one roadway and two sidewalks.

We manufacture STEEL STRUCTURES of all classes, particularly

BRIDGES and BUILDINGS

CONTRACTING OFFICES:
NEW YORK BOSTON BALTIMORE PHILADELPHIA PITTSBURGH CLEVELAND CINCINNATI
DETROIT CHICAGO ST. LOUIS DULUTH MINNEAPOLIS SALT LAKE CITY DENVER

Pacific Coast Distributor:
Columbia Steel Company
San Francisco, Calif. Los Angeles, Calif. Portland, Ore.
Seattle, Wash. Honolulu, T. H.

US STEEL

Export Distributor:
United States Steel Products Company
30 Church Street
New York, N. Y.

Uniformly Dependable

ILLINOIS

TIE PLATES AND ANGLE BARS

Illinois Steel Company
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208 South La Salle Street, Chicago, Illinois

NATIONAL PYRAMID BRUSHES **STANDARD FOR 40 YEARS**

Very early experimental model of Tesla induction motor.

Modern 4000/500-HP., 300/150-RPM., 2300-Volt, slip ring induction motor.

The Evolution of a Brilliant Conception

THE history of engineering achievement records few conceptions as brilliant as Nikola Tesla's recognition of the revolving magnetic field set up by polyphase alternating currents in a suitably distributed winding. The little motor illustrated above proved that this unique idea was feasible. But it was ahead of its time. Nearly all electrical power was then generated as direct current.

The discovery of the advantages of carbon for dynamo and motor brushes and the satisfying performance of National Carbon Brushes were factors in prolonging the leadership of direct current distribution. However, the concentration of power generation into larger stations and the increase in distance of transmission at last established alternating current distribution. It was then that the Tesla motor—the induction motor of today—found its place in industry.

In its simplest form, with no moving contacts in the electrical circuit, it was found that the characteristics of the induction motor were poorly adapted to many applications. Greater flexibility was given to its design by the use of a wound rotor connected through slip rings and brushes to an external circuit. National Pyramid Brushes thus came to have their part in this as in so many other phases of electrical development.

Forty years of manufacturing experience, progressive research and steady development have provided a National Pyramid Brush for every requirement in electrical industry.

CARBON

The adaptability of carbon is indicated by the use of carbon tubes in Cottrell precipitators operating on highly corrosive fumes such as sulphuric, hydrofluoric, and phosphoric acids. This illustrates the resistance of carbon to chemical action. Let our engineers assist in adapting carbon to your problem.

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Carbon Sales Division · Cleveland, Ohio

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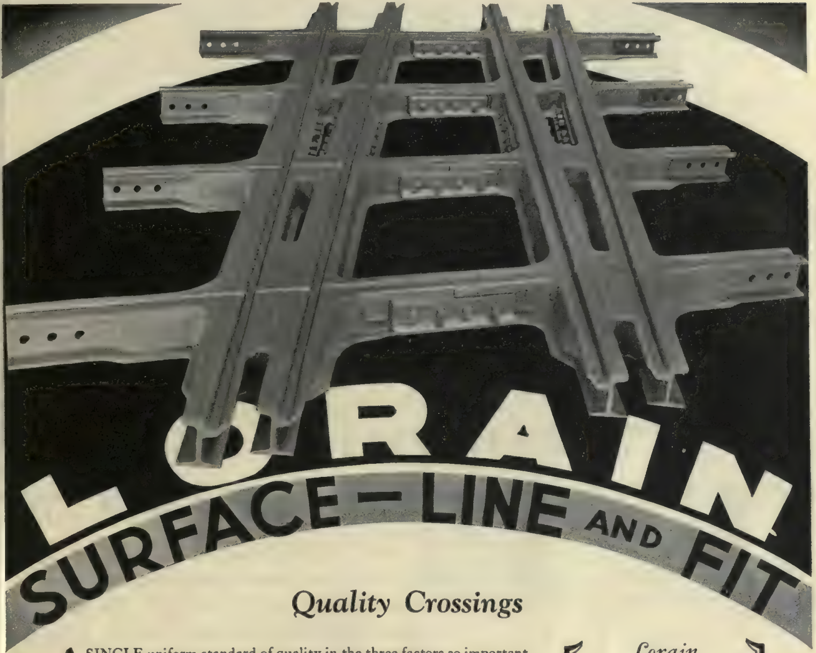

Quality Crossings

A SINGLE uniform standard of quality in the three factors so important in any crossing installation—surface, alignment and splice bar fit—is always available in Lorain design, materials and workmanship.

The photograph typically records for you to see Lorain quality in every characteristic of this intricate crossing. This highgrade, interlaced trackwork was made for installation for the Virginia Electric and Power Company at Richmond, Va. It contains four solid manganese steel crossings in four pieces, 7" deep, with external arms that conform to connecting sections. Interior construction is double-web box section throughout. The area under intersections is effectively reinforced and provided with ample supporting base flanges. The internal joints are fitted with heavy angle bars and large diameter bolts.

Lorain is headquarters for complicated trackage. A Lorain special construction will be a good solution wherever a trackwork problem exists.

Lorain

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GIRDER GUARD RAILS

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RAIL JOINTS AND TRACK ACCESSORIES

EXPANSION JOINTS FOR ELECTRICALLY WELDED TRACK

SPECIAL TRACKWORK

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Carey Elastite
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TRADE MARK REG'D U.S. PATENT OFFICE

RAIL FILLER

PREVENTS PAVING "KICK-UPS"

The wood block pavement illustrated was laid in 1919, and Carey Elastite Rail Filler was installed in the web of the rails. The total absence of paving "kick-ups," next to rails, is typical of paving which is protected by this method.

Carey Elastite Rail Filler is made of a reinforced asphalt compound. It is not affected by moisture or temperature changes and absorbs vibration which would otherwise be transmitted to the paving, greatly reducing the cost of track maintenance. The material is pre-molded to fit any type rail, making for rapid installation.

Prices and complete data for any project will be mailed on request.

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Branches in Principal Cities

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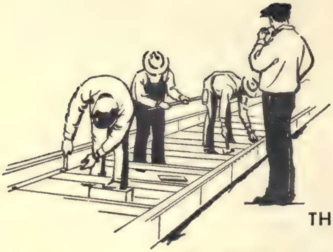


OIL TYPE FINISHES OBSOLETE?

Du Pont DULUX . . . a new type finish for street car and bus . . . sets new high standards for surface protection and retained good appearance

OIL type finishes are being replaced for exteriors and interiors of cars and buses.

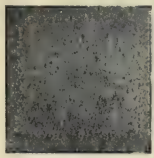
With du Pont Dulux you can now protect and retain the original good appearance of your cars longer than ever before.

In three-year service tests du Pont Dulux Finish indicates clearly its ability to retain its beautiful color and gloss 50% to 100% beyond the time set by any oil type paint finishes.

This remarkable record is due to a distinct new vehicle discovered in the famous du Pont Laboratories by chemists who had been studying for years in an attempt to produce a better car and bus finish.

The advantages of Dulux are obvious. It lowers maintenance costs. It means less refinishing . . . less time out of service for your cars or buses . . . more revenue for each unit annually. And companies have proved that Dulux is an economical finish for original finishing of new equipment, too.

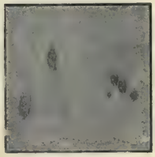
Sixty-five cars of this type have been finished inside and out with du Pont Dulux by the J. G. Brill Company



Metal Protective Paint Vehicle. This shows what happens to a film after only 7 months' exposure 45° south.

Dulux Vehicle. More than 175% longer life! The 45° southern exposure is doubly severe. Also each of the steel panels received only a single coat of clear vehicle without rust - inhibitive pigment.

METAL PROTECTIVE PAINT VEHICLE
7 Months' Exposure



DULUX VEHICLE
19 Months' Exposure

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Cars and buses handling heavy traffic do not have to be content with stiff, unyielding seats. Hale & Kilburn Construction insures profitable durability with the added comfort so popular with daily riders. Two of the H.&K. favorites for city and suburban service are illustrated. With many models to choose from, Hale & Kilburn Seats help make short-haul riders boosters for your service.

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Types 900-D and 940 H.&K. Chairs are splendid examples of the comfort expressed by sturdy mechanical construction, durable, springy cushions. and attractive upholstery fabrics. These seats are sound builders of intercity traffic. They give the rider the kind of comfort he has a right to expect—and demand. We are ready to advise and co-operate on chairs for such service.

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Again the keynote of comfort, with an added touch of luxurious ease—the H.&K. 960 Recliner. Available in a wide choice of fabrics to harmonize with bus interiors, and built to combine comfort during long trips with strong, durable construction, this chair should solve the long-haul seating problem.

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OF MODERN TRANSPORTATION"**

One Man in Forty—
and YOU *are the Man*

DID you ever stop to think that *you* are one of the comparatively small percentage of men whose "yes" or "no" really matters to American business?

Every morning 40,000,000 men start to work—in factories and mines, banks, railways, stores and other centers of industry or trade. Forty million men turn the wheels that keep America clothed, sheltered and fed.

But only one million of them make business decisions. Only one man in forty has the ability, the responsibility or the authority to say yes or no in business matters. Hence the *real* managing power of the country lies in the hands of these million men—less than one per cent of its total population.

As a member of this group—this controlling minority—you share an important responsibility—the triple responsibility of wisely liberal purchasing of generous employment and of sane management to hasten the return of general prosperity.

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How, you ask, do we know that *you* are one of the million who make decisions for others to follow? Because men who read business papers are alert and eager for news of new plans, new methods, new equipment. That is *why* they are the men who control affairs.

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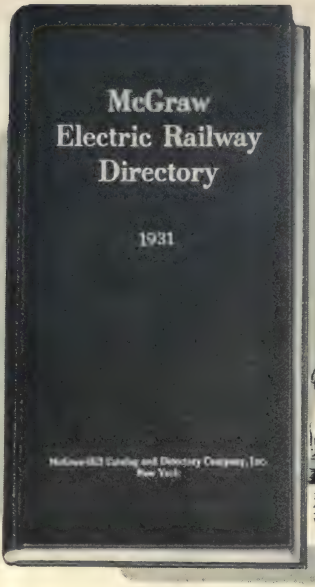

Is your salesman waiting to see the right man? Or is he wasting time?
Who controls that company in Cleveland now? What fare do they charge? What gage track do they use?
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Have they an affiliated bus line? How many buses do they operate? Where are the garages located? Who is the man to see?

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The 1931 edition of the McGraw Electric Railway Directory is especially designed for those who need comprehensive information covering this large industry.

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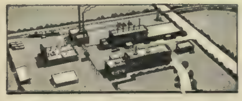

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ELECTRICAL INSULATION DEPARTMENT
Woodbridge New Jersey

ANNUAL CONVENTION NUMBER

ELECTRIC RAILWAY JOURNAL

September 14, 1929

"Getting Down to Fundamentals"

"Getting Down to Fundamentals" aptly expresses the present-day attitude of progressive railways and manufacturers of railway equipment.

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GENERAL ELECTRIC

Electric Railway Journal NEWS

New York, Saturday, February 15, 1930

LATE NEWS

381 New Buses Ordered for Service in New Jersey

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General Convention Information

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The Journal *plus* The News

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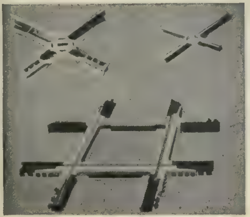

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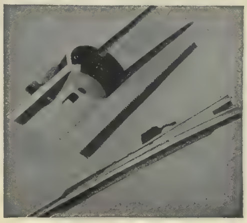

The New Wharton Switch

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Solid manganese steel and keyed center trackwork

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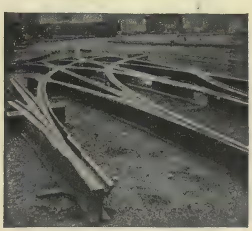

Surface Layout

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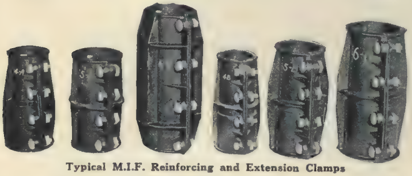
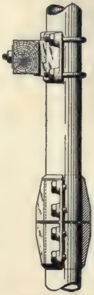


Typical M.I.F. Reinforcing and Extension Clamps

Their cost, installed, is less than for comparable results by other methods, whether used for corrosion at ground-line or at upper joints.

Sizes in stock for all standard poles. Poles of unusual lengths for temporary construction operations, etc., not ordinarily available, may be assembled from standard poles and extra length of pipe, using these Clamps.

Use Williams Pole Mounts for the special job of mounting poles, tubular steel or wood, on rock, concrete, bridges, etc.



"C" Clamp Extension and Gain Assembly.

Sales Bulletin No. 3 covers the above. Send for it.

Insulated Suspension Hangers for signal conductors, etc., as illustrated above, merit your consideration also—as well as our popular Guy Hooks and accessories, Crossarm Gains for wood and tubular poles, Aerial Cable Suspension Clamps, Catenary Clamps, H-Column Mounts, etc.

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News . . . .

brief, late news flashes for the electric railway industry

7

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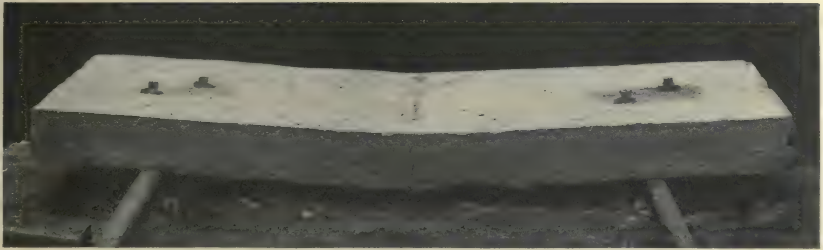
Subscription Price: For all countries taking domestic subscription rate, $2. Sold in combination with the monthly edition of *Electric Railway Journal* for $5 a year domestic rate.



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The
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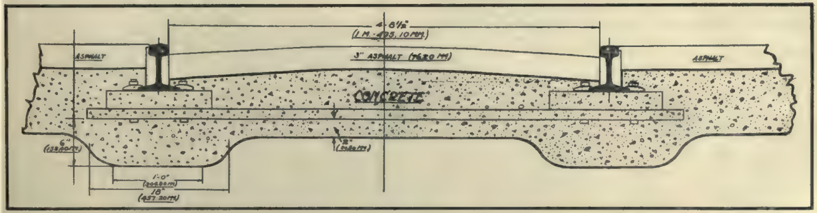
GREATER STRUCTURAL STRENGTH *plus* PROTECTION FROM VIBRATORY ACTION



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Two Directional Fusticlo Rail Contactors Used as Combination Cut-Outs and Starters. Also Shows Parkway Outlets.

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Operating Officials Demand Economy With Safety

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Contents Include:

Names and addresses of the Electric Railway Companies in the United States, Canada and the West Indies, arranged geographically by Post Office address. Names and addresses of officials and principal department heads. Names of subsidiary bus companies. Location of repair shops and power plants. Mileage of the road. Gage of track. Number and kind of cars used. Number of buses operated. Number of garages and capacity. Rates of fare. Transmission and Trolley voltages. Capacity of substations. Index of electric railway company officials, giving company connections.

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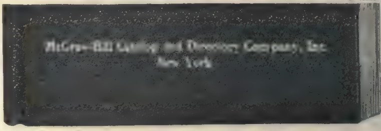

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Reduction of Noise and Vibration

Gear noises have been tolerated for years because it was considered they could not be eliminated without excessive cost.

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Even the rough brogans of stamping workmen do not injure the hard, tough surface of Tucolith floors.

6 REASONS WHY

Tucolith is the popular flooring material for cars and busses.

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2. Attractive
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4. Fireproof
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IN the face of heavy traffic which daily crosses interurban and electric traction lines, these lines have created enviable safety records. Maintain them! At each highway or grade crossing there should be protection not only for automobile or pedestrian but for the car as well. "Union" Highway Crossing Protective apparatus protects. It speaks a universal language, saying, "A train is coming." It gives this positive service 24 hours each day. And it gives the greatest protection for the least expense.

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ENCLOSED HEATING elements carry the Underwriters' Laboratories Label. They give 100% energy output for what you put in.

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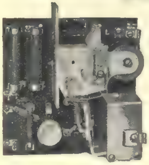

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with
Utility Heaters Regulators Ventilators

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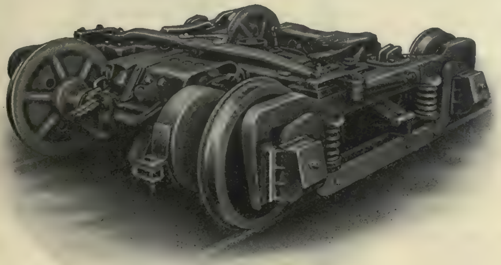
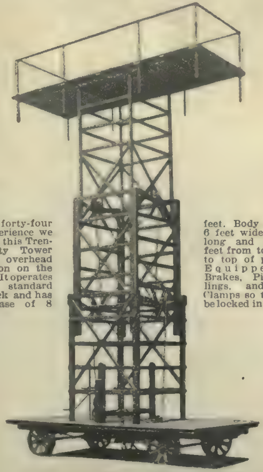


Commonwealth Trucks (Swing Motion Type) quickly demonstrate the fact that they are the product of specialization. When they go on the job for you they do a real job in the way of service. The cast steel frame including cross transoms and pedestals is one strong unit.

GENERAL STEEL CASTINGS CORPORATION
EDDYSTONE, PA. GRANITE CITY, ILL.

COMMONWEALTH TRUCKS
"SWING MOTION TYPE"

THERE'S A TRENTON TOWER *for Railway Work, too!*



From our forty-four years' experience we have built this Trenton Utility Tower to handle overhead construction on the railroads. It operates on ARA standard gauge track and has a wheelbase of 8 feet. Body platform 6 feet wide, 12 feet long and about 2 feet from top of rail to top of platform. Equipped with Brakes, Pin Couplings, and Rail Clamps so truck can be locked in position.

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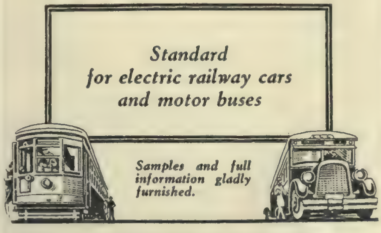
—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.



Standard for electric railway cars and motor buses

Samples and full information gladly furnished.

The PANTASOTE COMPANY, Inc.
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Have *Low* Maintenance

Where a pavement is to receive hard wear and is expected to last a long time, vitrified brick pavement is the best type to use.

The reason for brick pavement's low cost over a long period of years is because it withstands *weather* as well as traffic. The vitrified surface excludes absorption of moisture which, freezing in a pavement material, has a destructive spalling action. Asphalt filled, expansion and contraction due to temperature changes are amply provided for. Hot or cold, wet or dry, brick are not affected. Hence low upkeep.

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Added reasons for the use of brick pavements on track areas justify its history as the leading pavement for that purpose. Vibration and shock from heavy rolling stock are absorbed by the sand cushion underneath the brick and the asphalt filler at the sides. Brick may be removed without interruption to schedules for repairing track substructure and replaced in a few minutes times.

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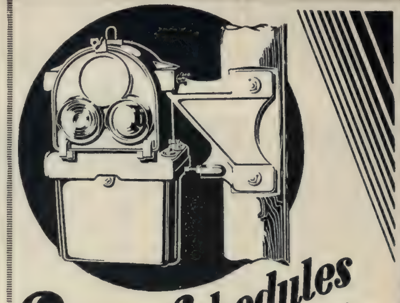

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Nachod Automatic Block Signals, operating independently of the train crew, insure safe, fast operation and eliminate vexatious delays at switches. They take chance and memory out of the picture . . . provide maximum safety under all conditions of operation. Block and Highway Crossing Signals, Headway Recorders. Nachod & U. S. Signal Co., Inc., Louisville, Ky.

"Nachod Spells Safety"

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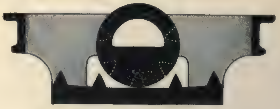

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ONLY TWO PARTS

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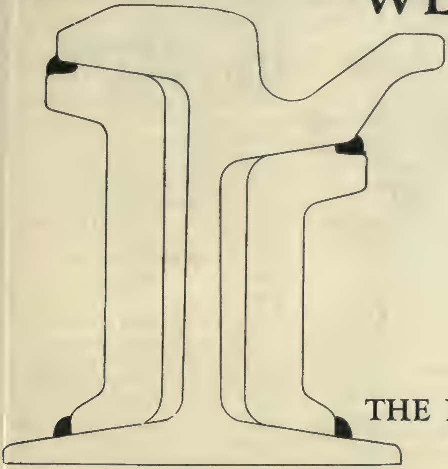

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For EFFICIENT, ECONOMICAL

JOINTS

Do you believe in statistics? Rely on performance records? If so, the performance records of the many "Weld Plates" now in use will convince you that they lead the bar-weld joints in efficiency and economy.

"Weld Plates" represent the most modern welding practice. They are the strongest and most up-to-date plates rolled especially for electric welded joints. Note the shape—the grooves for retaining plenty of weld metal along the upper edges—the wide contact areas at top and bottom—the suitability for the use of short bolts.

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HEMINGRAY GLASS COMPANY

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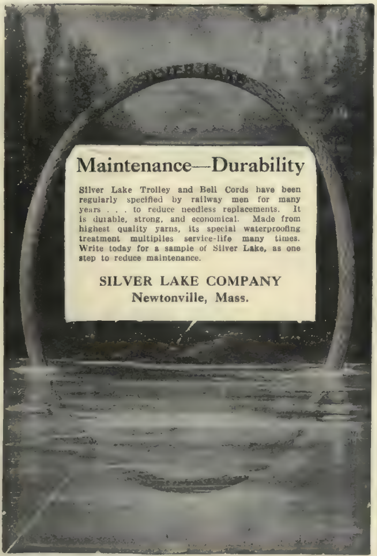

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of
INDUSTRIALS and PUBLIC UTILITIES

Chicago New York San Francisco

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Closes April 17th

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

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ELECTRIC CAR-HEATERS

THERMOSTATIC CONTROL

STEAM HEATERS FOR BUSES

COMPLETE PNEUMATIC DOOR AND STEP OPERATING EQUIPMENT

HIGH & LOW VOLTAGE BUZZERS & BELLS

SAFETY SWITCHES

SAFETY SWITCH PANELS

CONSOLIDATED CAR-HEATING CO., INC.
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Electrical
Wires & Cables

Quality Products

From the finest Magnet Wire
to Largest Power Cables.

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Sons Company,
Trenton, N. J.,
Makers of Wire
Rope and Wire*

For 130 of Detroit's New Cars

DURING the last few months Heywood-Wakefield Seating has been installed in 130 of the new cars put into operation by the Department of Street Railways in the City of Detroit. Such a tremendous order clearly indicates the merit of H-W Railway Seating. The chairs selected are the last word in modern electric car seating. They have the H-W cut-in back feature which permits closer spacing, yet allows more leg room for the passengers; a new type, full length grip rail with aluminum castings; spring cushions and backs; and an exceptionally rugged stamped steel underconstruction built to withstand the most severe use and abuse. If you are contemplating the buying of new rolling stock or rehabilitating present equipment, ask your nearest H-W Sales Office for complete helpful information on railway seating. No cost or obligation on your part, of course.

HEYWOOD-WAKEFIELD

Heywood-Wakefield Co., Boston, Mass.; 516 West 34th Street, New York City; 311 Railway Exchange Bldg., Chicago, Ill.; The G. F. Cotter Supply Co., Houston, Texas; J. R. Hayward, Liberty Trust Bldg., Roanoke, Va.; H. G. Cook, Hobart Bldg., San Francisco, Calif.; A. W. Arlin, Delta Bldg., Los Angeles, Calif.; The Railway & Power Engineering Corp., 133 Eastern Ave., Toronto; Montreal, Winnipeg, Vancouver, Canada

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Positions Wanted, 5 cents a word, minimum $1.00 an insertion, payable in advance.

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Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads

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1 inch	$6.00
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4 to 7 inches	5.50 an inch

Other spaces and contract rates on request.

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TRACK foreman wanted, familiar with special track work on high-speed electric lines. If you desire such a position insert an advertisement in the Searchlight Section of Electric Railway Journal. Over 6,000 other electric railway men will see your advertisement. Send your copy to Searchlight Department, Tenth Ave. at 36th St., New York.

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SUPERINTENDENT transportation, long experience, successful record, covering every phase of transportation. Now engaged. Desires change. Correspondence invited. Highest references. Available short notice. Go anywhere. PW-245, Electric Railway Journal, Tenth Ave. at 36th St., New York.

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A BUSINESS opportunity advertisement placed in this column will be read by over 6,000 men actively engaged in the Electric Railway field. Place your advertisement here, if you need capital to finance a project. If you wish to buy or sell property pertaining to the Railway industry, If you wish to finance some railway project? etc. You will find it pays to tell your story here. Send your advertisement to the Searchlight Dept., Tenth Ave. at 36th St., New York.

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MACHINERY BARGAINS

6′ Bickford S.P.D. Radial Drill	$850
16″ Smith-Mills Shapers	300
21″ Smith-Mills Shaper	550
5′ Morton Draw Cut Shaper	650

H. E. CYPHERS
803-4th St., Harrison, N. J.

Even When the "Old Skipper" of the "Toonerville" line is ready to sell out

he'll find that we'll make a most attractive offer for the complete system or any part of it! We specialize in the buying of surplus steam or electric railway equipment of any description—anywhere!

Where we buy your system in its entirety we dismantle. Our expert dismantling crew handles the work quickly and without trouble to you.

Get our "spot cash" quotations on your surplus cars, poles, trackage, power house equipment, etc. Send a list of your equipment today—liquidate those frozen assets!

RELAYING RAIL *Considerable tonnage available for immediate disposal!*

Gordon and Gerber, 330 Third Street, Chelsea, Mass.

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2 AUTOMATIC SUBSTATIONS

60 cy. complete with 500 kw., 600 v. Synchronous Converters with Outdoor 13.2 Kv. Switch Equipment, and Transformers and Accessories. *Further details upon request.*

FS-244—Electric Railway Journal
Tenth Ave. at 36th St., New York City

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TO BUY, SELL, RENT and EXCHANGE—Used and Surplus New Equipment and Material.

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Your Best Market
for
Old Trolley Cars and Equipment
Reliable Service

L. SCHIAVONE & BONOMO BROS, Inc.
Jersey City New Jersey

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Consult us also about New and Relaying Rails—all weights and sections. You will like our service.

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(Minimum Lots 5000 Lbs.)
If Bought Before May 15th

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Passenger Cars and Work Car at one cent per pound.

All in good condition — formerly used on properties of Elmira, Corning & Waverly Railway, Elmira, N. Y.

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COrtlandt 7-3322

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Twenty-nine and Thirty-three passenger Parlor Coaches, manufactured by the Yellow Coach Division of General Motors. These coaches are in unusually good condition. Attractive prices for quick disposal.

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27th and Girard Ave., Philadelphia, Pa.

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64—"WS" Series, four cylinder Engines.

80—100 and 120 hp., 950 r.p.m. Industrial Type, ready for service. Like new. Price $950 each. Cost new $2,700.

8—"HL" Series, four cylinder Engines, 75 hp., 1,000 r.p.m., Industrial Type, ready for service. Only used 30 days. Price $475 each. Cost new $1,400.

12—Model 8B Series, six cylinder, Red Seal Continental, 60 hp., Industrial Type, ready for service. New 1930. Price $350 each. Cost new $1,200.

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1622 So. First Street, Milwaukee, Wisc.

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RAILWAYS PURCHASED IN THEIR ENTIRETY

Surveys gladly made at our expense. Our long experience assures you the best price obtainable on your equipment.

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Modern Lightweight Double Truck Cars
Birney Cars
300 K.W. Interpole 25 Cycle Rotary Converter
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New WH-H L Controller
48" Table Vertical Boring Mill
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Cleveland and Johnson Fare Boxes
264-A Motors
77-E1 Trucks
K-35-G Controllers

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For lower cleaning costs

WHETHER your rolling stock consists of cars, buses, or both, you can keep it clean inside and out at low cost with Oakite materials and methods.

Oakite cleaning materials remove dirt from painted, varnished and lacquered surfaces quickly and economically. They loosen grease and muck from chassis and trucks without laborious hand scraping or scrubbing.

Tell us your cleaning problems and learn how the new lower prices of Oakite materials mean greater savings than ever before, on all kinds of electric railway cleaning. No obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

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OAKITE PRODUCTS, INC., 28B Thames Street, NEW YORK, N. Y.

OAKITE
TRADE MARK REG U S PAT OFF
Industrial Cleaning Materials and Methods

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Car roofs can cost less to maintain

Many operating companies are using DIXON's Bright Aluminum as their standard car roofing paint. They proved to their satisfaction that its greater durability expressed in longer periods between repaintings, has enabled them to materially reduce this item of car maintenance.

And there is sound reason. For an aluminum pigment (Albron) in a vehicle of tough spar varnish maintains its brilliancy in spite of the weather. Smoke, dirt, dust do not tarnish it. The pigment does not precipitate.

DIXON's Bright Aluminum not only deflects heat—it reflects prosperity. It builds good will, it attracts profits.

A trial of 5 gallons will convince you, or write for Circular 180-BA.

Paint Sales Division
Joseph Dixon Crucible Co.
Established 1827
Jersey City New Jersey

DIXON'S BRIGHT ALUMINUM PAINT

WHY USE THREE SETS OF POLES
. . WHEN ONE WILL DO ? ? ? ? ? ? ? ?

FLUTED Steel all-purpose poles do the work which formerly required two or three separate sets of poles. Electric railway feeder lines and span wires, lighting units, distribution lines, traffic signals and other equipment can all be accommodated on one set of Union Metal Poles.

The unsightly forest along the curb-line is done away with—and graceful, dignified standards which harmonize with city architecture are substituted.

The economies which result from such an installation commend themselves to the attention of every utility and city official. The improvement in the appearance of the street costs nothing. It is the inevitable result of every Union Metal Pole installation.

We would like to tell you of some of the many interesting applications and installations which have been made. Write the nearest representative for information.

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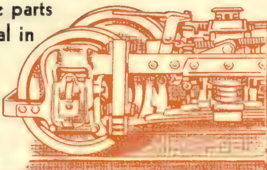
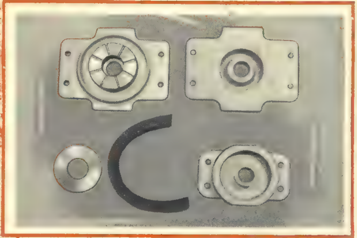
WHEN LOWER MAINTENANCE ACCOMPANIES IMPROVED SERVICE

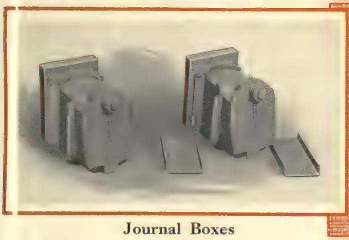
"Original" renewable parts
are more economical in
the long run.



Brake Pins and Bushings
Case hardened

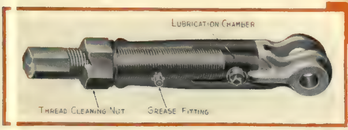


Oil-retaining Center Bearing
Drop forged pivot plates and steel wear ring for long life.



Journal Boxes
New Type Lid. Renewable spring steel wear plates and pedestal gibs protect boxes from wear.

Half-ball Brake Hangers
With drop forged hangers, renewable wear caps and bushed hanger and shoe holders.



Closed end Brake Rod
Systematic lubrication and easy adjustment.

there is greater satisfaction than in cheaper first cost

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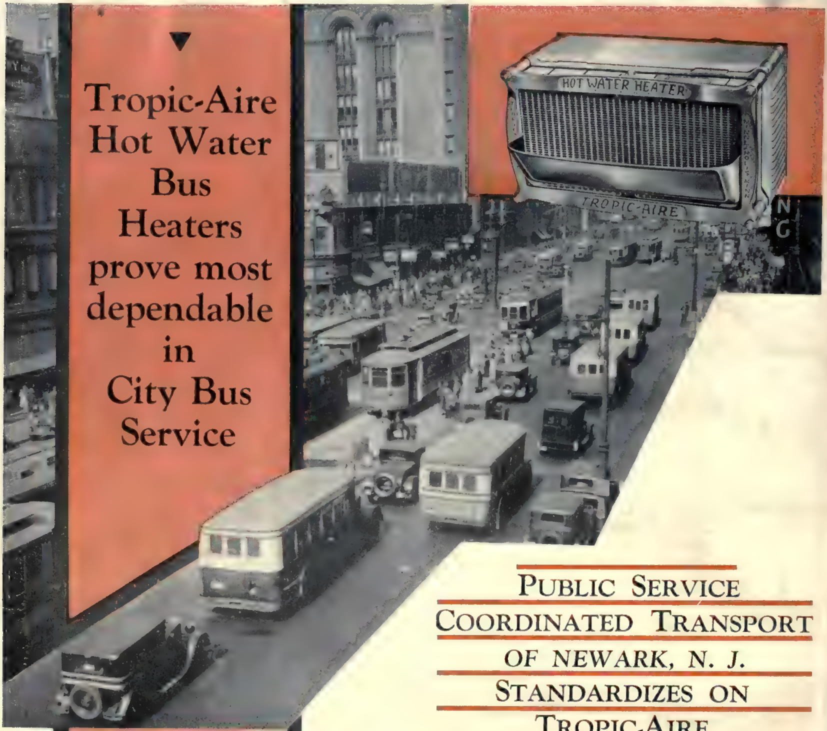

PUBLIC SERVICE COORDINATED TRANSPORT OF NEWARK, N. J. STANDARDIZES ON TROPIC-AIRE

This huge bus organization serving city bus riders keeps its buses inviting thru means of comfortable heat and clean, pure air. They can depend on Tropic-Aire to furnish plenty of fumeless heat, regardless of weather conditions or frequent stops.

Tropic-Aire eliminates hundreds of pounds of exhaust piping and valves. These heaters are easily installed and entail practically no maintenance expense.

Tropic-Aire brings the comfort of hot water heat to bus riders and gives you a new asset in encouraging bus travel.

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HOT WATER BUS HEATERS

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